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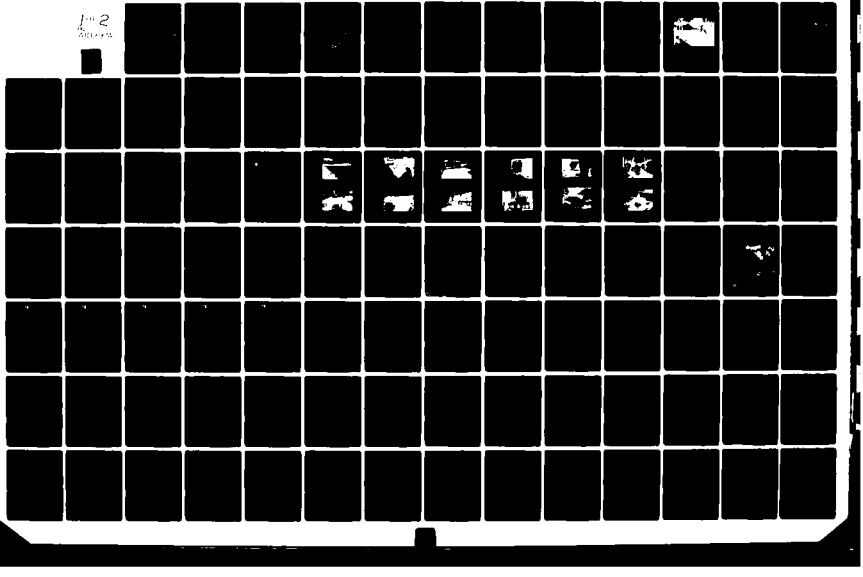

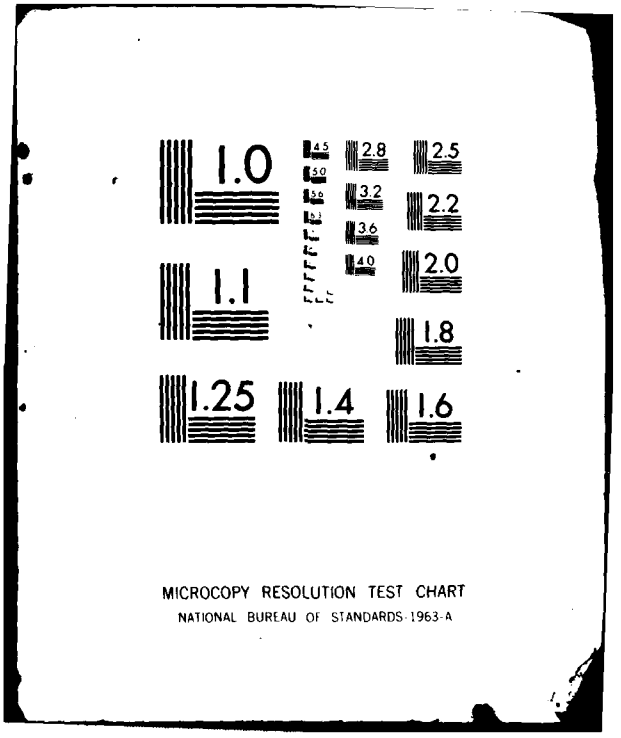
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Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability
Guilford Lake Dam
Chanango County
Susquehanna River Basin

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Examination of available documents and visual inspections of the dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies that need to be evaluated and remedied.

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Using the Corps of Engineers' screening criteria for the initial review of spillway adequacy, it has been determined that the dam would be overtopped by all storms exceeding 16 percent of the Probable Maximum Flood (PMF). Dam overtopping, the resulting erosion of the embankment and hence, dam breaching would cause water surface levels downstream to reach depths which would pose significant danger to residents. Therefore, the spillway is adjudged to be seriously inadequate and the dam is assessed as unsafe, non-emergency.

The classification "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean that there appears to be a serious deficiency in spillway capacity and if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard to life downstream of the dam.

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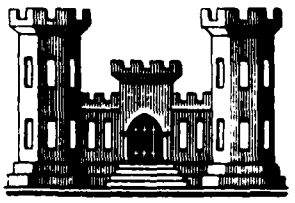
SUSQUEHANNA RIVER BASIN

GUILFORD LAKE DAM

CHENANGO COUNTY, NEW YORK
INVENTORY No. NY 1483

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



NEW YORK DISTRICT, CORPS OF ENGINEERS
JUNE 1981

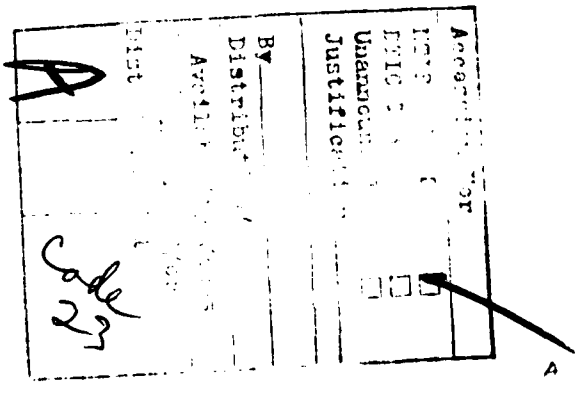
PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.



PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
GUILFORD LAKE DAM
INVENTORY NO. NY 1483
SUSQUEHANNA RIVER BASIN
CHENANGO COUNTY, NEW YORK

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Guilford Lake Dam
State Located:	New York
County:	Chenango
Watershed:	Susquehanna River Basin
Watercourse:	Guilford Creek
Dates of Inspection:	March 12 and 14, 1981

ASSESSMENT

Examination of available documents and visual inspections of the dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies that need to be evaluated and remedied.

Using the Corps of Engineers' screening criteria for the initial review of spillway adequacy, it has been determined that the dam would be overtopped by all storms exceeding 16 percent of the Probable Maximum Flood (PMF). Dam overtopping, the resulting erosion of the embankment and hence, dam breaching would cause water surface levels downstream to reach depths which would pose significant danger to residents. Therefore, the spillway is adjudged to be seriously inadequate and the dam is assessed as unsafe, non-emergency.

The classification "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean that there appears to be a serious deficiency in spillway capacity and if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard to life downstream of the dam.

It is recommended that the following additional investigations be performed by a registered professional engineer engaged by the owner:

1. Conduct a detailed hydrologic and hydraulic analysis to more accurately determine the site specific characteristics of the watershed.

2. No design or construction data was available; therefore, attempt to obtain plans or details of the structure including the construction history and the nature and properties of the foundation bearing materials as well as the materials behind the spillway. This data is necessary to implement Investigations 3 and 4 below. If no such data is available, it may be necessary to conduct subsurface explorations to obtain the information required for the appropriate assessments.

3. Perform a structural stability analysis on the dam using data obtained as a result of Investigation 2 that will assess the effect of the earth and rockfill behind the spillway on the overall stability of the spillway and recommend remedial measures, if necessary.

4. The concrete spillway apron was severely cracked and deteriorated; therefore, design a new concrete or riprap apron for the spillway and recommend an appropriate method to construct it.

It is recommended that within 3 months of the final approval date of this report, all of the additional investigations should be initiated and within 18 months, appropriate remedial measures should be completed. In the interim, a plan for providing around-the-clock surveillance of the dam during periods of unusually heavy precipitation should be developed and implemented.

The following remedial measures should be completed within 12 months to correct existing deficiencies:

1. Remove the fallen logs in the discharge channel and clear the brush and trees from the side slopes.

2. Repair the cracked 6 inch diameter gate valve on the water distribution pipe (reservoir drain).

PHOTO #1: Overview of Guilford Lake Dam
Inventory No. NY 1483

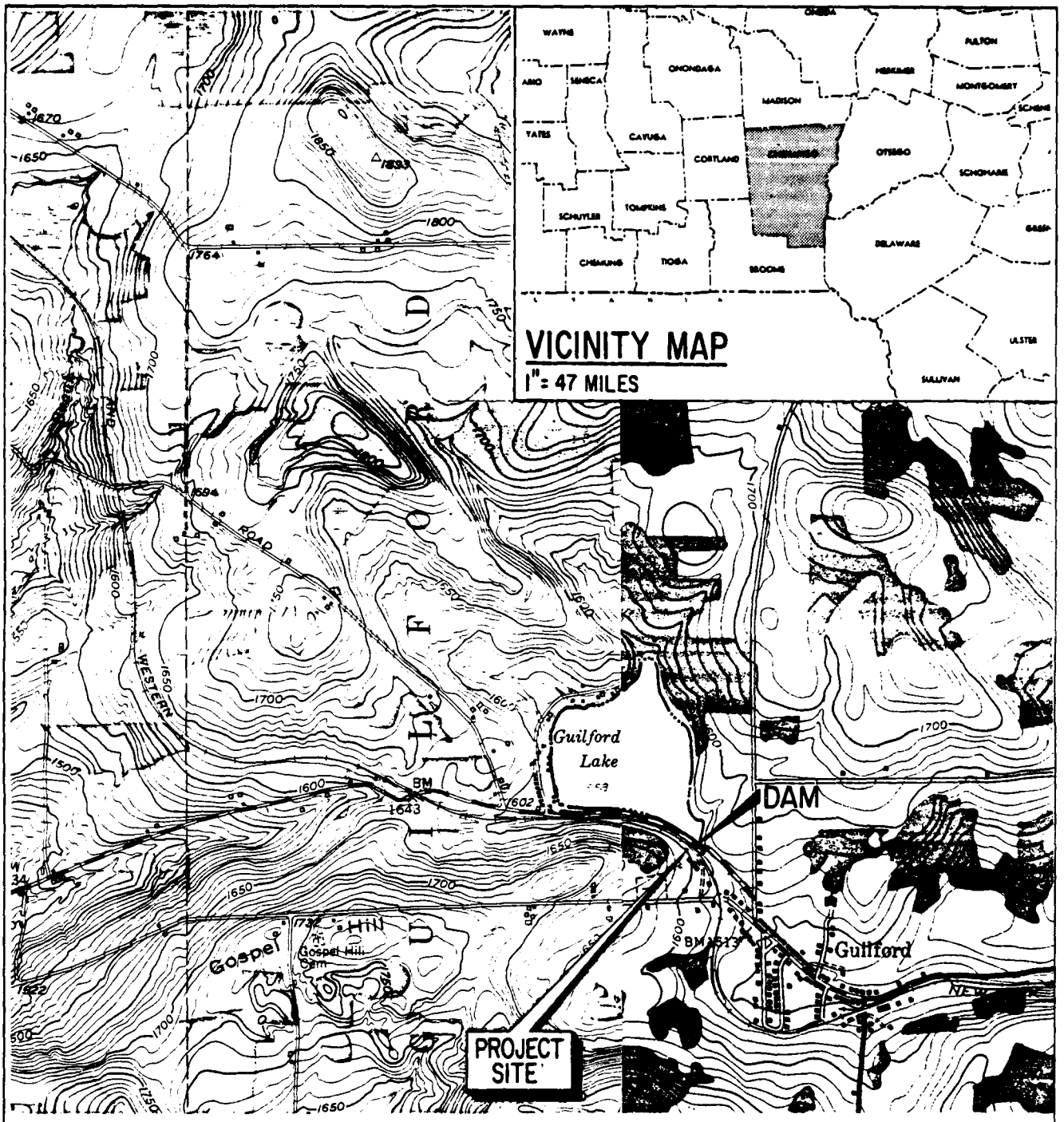
3. Develop and implement a flood warning and emergency evacuation plan to alert downstream residents in the event conditions occur which could result in failure of the dam.

Submitted by: FLAHERTY GIAVARA ASSOCIATES, P.C.

Hugh C. Flaherty, P.E. & L.S.
Chairman of the Board
New York License No. 58508

Approved by:
Col. W. M. Smith, Jr.
New York District Engineer

Date: 15 Sep 81



LOCATION MAP

GUILFORD LAKE DAM
INVENTORY No. NY 1483

SUSQUEHANNA RIVER BASIN
CHENANGO COUNTY
GUILFORD, NEW YORK

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SCALE IN FEET

FLAHERTY · GIAVARA ASSOCIATES, P.C.

NATIONAL DAM SAFETY PROGRAM
PHASE I INSPECTION REPORT
GUILFORD LAKE DAM
INVENTORY NO. 1483
D.E.C. NO. 118A-4464
SUSQUEHANNA RIVER BASIN
CHENANGO COUNTY, NEW YORK

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase I Inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367. Flaherty Giavara Associates, P.C. has been retained by the New York District to inspect and report on selected dams in the State of New York. Authorization and notice to proceed was issued to Flaherty Giavara Associates, P.C. under a letter of December 24, 1980 from W. M. Smith Jr., Colonel, Corps of Engineers. Contract No. DACW 51-81-C-0006 has been assigned by the Corps of Engineers for this work.

b. Purpose

Evaluation of the existing conditions of the subject dam to identify deficiencies and hazardous conditions, determine if they constitute hazards to life and property and recommend remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

Guilford Lake Dam is an earth and rockfill structure consisting of an overflow spillway spanning the majority of the length of the dam. The spillway weir and downstream face have been capped with concrete and concrete abutments and retaining walls exist at either end of the spillway. The concrete portions of the dam were refurbished in 1978 and 1979.

The overall length of the dam is 62 feet and the height is 15 feet. Other pertinent data on the dam is included in Section 1.3. A cast iron water supply pipe extends through the dam near the bottom of the spillway in proximity to the right abutment.

The discharge channel is rock-lined and 15± feet wide. The channel side slopes are approximately 1.5 horizontal to 1 vertical. The left side slope is predominantly a rock cut, while the right side slope appears to be an earth cut with occasional rock outcrops.

b. Location

The Guilford Lake Dam is located off Chenango County Road 35 approximately 0.4 miles west of the village of Guilford in the Town of Guilford, New York. The dam is located at latitude north 42°-24.6' and longitude west 75°-29.8' on the U.S. Geological Survey 7.5 minute series topographic map "Guilford, New York". The Location Map on page i indicates where the dam is situated.

c. Size Classification

The maximum height of the dam is 15 feet and the maximum storage capacity is 560 acre-feet. Therefore, Guilford Lake Dam is classified as a "Small" dam as defined by the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

There are two roads and approximately 10 buildings within the dam failure flood hazard area. Therefore, the dam is in the "High" hazard category as defined by the Recommended Guidelines for Safety Inspection of Dams.

e. Ownership

The dam is owned by the Town of Guilford. The address and telephone number is as follows:

Owner

Contact: Mr. Austin Bourn
Highway Superintendent
Town of Guilford
R.D. 1 - Box 103
Guilford, New York 13780

Telephone: (607) 895-6818

f. Purpose

The primary purpose of this dam is water supply for the Town of Guilford.

g. Design and Construction History

An accurate date of construction is unknown; however, the dam has been described in deeds dating back to 1827. The construction history of the dam indicates that it was breached in the late nineteenth century and subsequently was reconstructed. The only major post construction modification noted was the concrete refurbishing of the spillway done in 1978 and 1979 by the County of Chenango.

h. Normal Operating Procedure

There are no regular operating procedures for this dam. The normal water level in the reservoir is maintained by the crest elevation of the spillway weir at approximately 1558.0 (NGVD).

1.3 PERTINENT DATA

a. Drainage Area (Square Miles)	2.23
b. Discharge at Dam Site (CFS)	
- Top of Dam	451
- Crest of Spillway	3
- Reservoir Drain Inlet	-
c. Elevations (NGVD - estimated)	
- Top of Dam	1560.2
- Crest of Spillway	1558.0
- Reservoir Drain Inlet	-
d. Reservoir Surface Area (Acres)	
- Top of Dam	84
- Crest of Spillway	74
- Reservoir Drain Inlet	-
e. Storage (Acre-Feet)	
- Top of Dam	560
- Crest of Spillway	390
- Reservoir Drain Inlet	-
f. Dam	
- Type: Earth and rockfill	
- Length (Feet)	62
- Upstream Slope (H:V)	-
- Downstream Slope (H:V)	1:9
- Crest Width (Feet)	8.3

g. Spillway

- Type:	Concrete weir, abutments, downstream face and apron
- Length (Feet)	43.5
- Width (Feet)	8.3
- Side Slopes (H:V)	vertical
- Control:	None

h. Spillway Discharge Channel

- Type:	Excavated into earth
- Length (Feet)	50±
- Bottom Width (Feet)	15±
- Side Slopes (H:V)	1.5:1
- Channel Bottom Slope (Feet/Foot)	-
- Control:	None

i. Reservoir Drain

- Type:	6 inch diameter cast iron water supply distribution main also serves as the reservoir drain
- Control:	Two 6 inch gate valves

SECTION 2 - ENGINEERING DATA

2.1 GEOTECHNICAL DATA

a. Geology

The Guilford Lake Dam is located on Guilford Creek, a southeasterly flowing tributary to the Unadilla River, about 0.4 miles northwest of the village of Guilford in the Allegheny Plateau physiographic province of New York State.

The topography in the area ranges from elevation 1540 in the streambed downstream of the dam to elevation 1700 atop the hills immediately north and south of the dam. The elevation of Guilford Lake behind the dam is 1558 (NGVD).

Exposed bedrock at the site is the Oneonta Formation, belonging to the Upper Devonian Genesee group. This formation consists of red to green and reddish brown, medium-bedded sandstones and coarse silty sandstones, with minor amounts of conglomerate. It is well-jointed locally and contains numerous current features such as cross-bedding and ripple marks. This formation represents a terrestrial deposit (at or just above sea level) containing a mosaic of distributary channel, floodplain and beach deposits, and is part of the massive Catskill Delta complex that prograded across the state from east to west.

Where bedrock is not exposed, some or all of the valley bottom may be mantled with glacial till, a heterogeneous mixture of clay, silt, sand, gravel and cobbles, deposited at the base of ice sheets that once covered the region. This in turn is probably overlain by well-sorted sands and gravels deposited first by glacial meltwater streams and later by Guilford Creek and subsidiary tributary streams.

b. Subsurface Conditions

There are no known records of subsurface explorations at the site of Guilford Lake Dam.

2.2 DESIGN RECORDS

No records were obtained concerning the original design of the dam.

2.3 CONSTRUCTION RECORDS

The dam is known to have existed in some form as far back as 1827, but no construction records were available.

2.4 OPERATION RECORDS

No operation records were obtained for this dam.

2.5 EVALUATION OF DATA

The data presented herein was obtained primarily from the files of the New York State Department of Environmental Conservation (DEC) but also from the Town of Guilford. This information appears to be reliable and adequate for the purposes of a Phase I Inspection Report.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspections of the Guilford Lake Dam were conducted on March 12 and 14, 1981. The weather was mostly overcast and the temperature was 35±°F. At the time of the inspection, there were patches of snow on the ground and water was flowing over the spillway (See Photo No. 5).

b. Dam

The embankment portion of this dam is generally in good condition (See Photo No. 1). There was no visible evidence of lateral movement, settlement, erosion or other serious defects.

c. Spillway

The spillway is generally in good condition (See Photos No. 4, 5, 6, 7, 8, 9, and 10); and except for the apron, there was no visible evidence of lateral movement, settlement or cracking and no seepage was observed at or behind the abutment walls.

The following specific items were noted:

1. The concrete spillway apron was severely cracked and deteriorated, and major portions of it were displaced or eroded away (See Photo No. 11).

2. Earth and rockfill were observed to extend approximately 20 feet back from the spillway before sloping down into the reservoir. The top of this fill was 10 to 15 inches below the top of the spillway. The water level behind the spillway on the date of the visual examination was approximately level with the top of the spillway (See Photo No. 3).

3. A few small diameter fallen logs were observed in the discharge channel and the side slopes of the discharge channel were covered with trees and brush (See Photo No. 12) and several logs and other debris have accumulated on them. Neither the material in the channel bottom nor the material on the side slopes represents a potential threat to blockage of flow in the discharge channel.

4. A 6 inch diameter gate valve on the cast iron water distribution pipe was cracked and leaking (See Photo

No. 13).

d. Downstream Channel

The natural channel downstream of the dam is located beyond the spillway. It has a width of 15± feet and a depth of 6 inches (See Photo No. 12).

e. Reservoir - Storage Pool Area

The reservoir area is bordered by Chenango County Road 35 on the south edge of the impoundment and moderately sloping open fields and woodlands to the north, east and west (See Photo No. 2). There does not appear to be any significant probability of landslides into the storage pool affecting the safety of the dam.

3.2 EVALUATION OF OBSERVATIONS

Visual inspections revealed some deficiencies on this structure. The following items were noted:

a. The concrete spillway apron was severely cracked and deteriorated.

b. Earth and rockfill were observed to extend 20± feet behind the dam before sloping down to the reservoir.

c. A few small diameter fallen logs were noted in the spillway discharge channel and its side slopes were covered with trees and brush.

d. A 6 inch gate valve on the water distribution pipe (reservoir drain) was cracked and leaking.

SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The normal water surface level is maintained by the crest of the spillway weir at elevation 1558.0 (NGVD). The only operational procedure in effect at this time is the withdrawal of water through the 6 inch diameter cast iron pipe for water supply to the Town of Guilford.

4.2 MAINTENANCE OF DAM

No regular maintenance operations are performed on Guilford Lake Dam.

4.3 WARNING SYSTEM

No warning system is presently in effect.

4.4 EVALUATION

Presently, there are no maintenance procedures in effect for this dam. Therefore, a program for regular maintenance should be developed and implemented.

SECTION 5 - HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

The dam is located in the Town of Guilford on Guilford Creek, approximately 7.5 miles upstream of the Unadilla River. Guilford Creek joins the Unadilla River at the village of East Guilford, 1.5± miles upstream of the Susquehanna River at Sidney, New York.

The watershed (shown on the Watershed Map on Page C-5 in Appendix C) consists of 1,430 acres (2.23 square miles) of rolling uplands with typical slopes of 5 percent. Land within the watershed is primarily agricultural with extensive open fields. There are no significant waterbodies within the drainage area; however, there are three wetland areas of 15, 3 and 9 acres approximately 5000 feet, 7000 feet and 9000 feet respectively, upstream from the dam.

The watercourse upon which the reservoir is located, is a perennial stream with a typical flow width of 15 feet and a typical flow depth of 6 inches.

5.2 ANALYSIS CRITERIA

The purpose of the hydrologic/hydraulic analysis is to evaluate the spillway capacity and the potential for overtopping. The analysis of the spillway capacity of the dam and storage of the reservoir was performed using the Corps of Engineers' HEC-1 Computer Model - Dam Safety Version. The procedure included determining the Probable Maximum Flood (PMF) runoff from the watershed and routing the inflow hydrograph through the impoundment to determine the outflow hydrograph. The unit hydrograph was defined by the Snyder Synthetic Unit Hydrograph method, and the Modified Puls routing procedure was incorporated.

The initial rainfall loss was assumed to be 1.0 inches, and the uniform rainfall loss was assumed to be 0.1 inches per hour. In accordance with recommended guidelines of the Corps of Engineers, the Probable Maximum Precipitation (PMP) was 20.3 inches (24 hour duration, 200 square mile area).

The analysis was conducted for both the full PMF and for several fractional PMF conditions. The PMF inflow of 4,833 CFS was routed through the reservoir and the peak outflow was determined to be 3,852 CFS.

5.3 SPILLWAY CAPACITY

The total outlet capacity is the sum of the discharges from the spillway and the water distribution pipe. However, for the purpose of this analysis and to be conservative, it was

assumed the gate valves on the reservoir drain were in the closed position.

The spillway consists of a 45 foot long broad-crested concrete weir.

The stage discharge data for the spillway was calculated for the stages tabulated below:

Stage (Feet)	Discharge Capacity (CFS)	Element of Structure
1558.0	0	Spillway Crest
1558.5	48	--
1559.0	135	--
1559.5	248	--
1559.8	326	Top of Left Abutment
1560.0	385	--
1560.2	451	Top of Dam

The total spillway capacity at the top of dam is 451 CFS.

5.4 RESERVOIR CAPACITY

The storage capacity of the reservoir was calculated for the stages indicated below:

Stage (Feet)	Storage (Acre-Feet)	Storage (Inches of Runoff)
1558.0	390	3.27
1560.2	560	4.70

5.5 FLOODS OF RECORD

No data regarding flood levels was obtained for this dam; however, the dam was washed out in the late nineteenth century.

5.6 OVERTOPPING POTENTIAL

The results of the HEC-1 DB computer analysis indicate that the crest of the dam is overtopped by all storms exceeding 16 percent of the PMF event. The PMF discharge rate of 3,852 cubic feet per second (CFS) would occur at a peak flood stage of 1565.7 feet, which is 5.5 feet above the crest of the dam.

The results of the analysis are on the following page:

Flood Condition	Peak Inflow (CFS)	Peak Outflow (CFS)	Maximum Stage Elevation (NGVD)
0.5 PMF	2416	1860	1562.8
1.0 PMF	4833	3852	1565.7

5.7 EVALUATION

Using the Corps of Engineers' screening criteria for the initial review of spillway adequacy, it has been determined that the capacity of the spillway is not adequate to pass one half the PMF; only approximately 16 percent of the PMF can be safely passed before overtopping will occur (assuming the worst condition; i.e., the valves of the principal spillway are closed). The PMF event would overtop the dam for a duration of 15 hours and the maximum depth of flow over the crest would be 5.5 feet. It is estimated that breaching of the dam as a result of overtopping, would cause water surface levels downstream to reach depths which would pose significant danger to residents. Therefore, the spillway is adjudged to be seriously inadequate and the dam is assessed as unsafe, non-emergency.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Except for the deteriorated concrete apron, there was no visible evidence of settlement, lateral movement or other signs of overall structural instability of the dam during the site examination. Based on the conditions that were observed, there would be no reason to question the static structural stability of the dam. However, lateral forces associated with the fill behind the spillway should be considered in any overall evaluation of dam stability.

b. Design and Construction Data

There is no construction data to confirm the actual nature and physical properties of foundation bearing materials which are expected to be bedrock. However, the apparent satisfactory performance of the dam indicates that there is some safety margin with respect to stability under static loading conditions, even with the earth and rockfill behind the dam.

c. Operating Records

No operating records were obtained for Guilford Lake Dam.

d. Post Construction Changes

The only post construction change noted was the concrete refurbishing of the spillway in 1978 and 1979.

6.2 STRUCTURAL STABILITY ANALYSIS

Available information and field data indicate this spillway is a consolidated rock section with a thin concrete cap and downstream face protective slab. Due to the lack of continuity of the cross section, no resistance to overturning could be assessed for this structure. In addition, the theoretical location of the resultant of forces does not apply to a structure of noncontinuous material. As part of the present study, stability computations relative to the sliding factors of safety were performed.

The stability analysis is presented in Appendix E. The results of the stability computations are summarized in the table on the following page:

Loading Condition (Spillway Section)	[1]Factors of Safety: Over-turning	[2]Sliding	[3]Location of Resultant Passing Through Base
1. Normal loading condition: water level at 1 foot above spillway crest	N/A	1.86	N/A
2. Maximum operating condition: water level at top of dam (4.2 feet above spillway crest)	N/A	1.62	N/A
3. 0.5 PMF condition: water level at El. 1562.8 (4.8 feet above spillway crest)	N/A	1.26	N/A
4. Ice loading condition: 5.0 Kips per foot acting at top of spillway	N/A	1.15	N/A

[1]These factors of safety indicate the ratio of forces resisting sliding to those causing sliding.

[2]As determined applying the friction-shear method.

[3]As a result of the type of material comprising the spillway core this number cannot be determined.

The analysis indicates that the consolidation of the earth and rockfill capped with concrete and the consolidated material which has accumulated behind the spillway contribute significantly to the stability of the structure.

Nonetheless for all cases of loading, the factors of safety against sliding were marginal to unacceptable.

The fact that the spillway exhibits apparently good structural stability can be explained by the indeterminate nature of the material accumulating behind it.

The Guilford Lake Dam is located in Seismic Zone I and in accordance with recommended Phase I guidelines does not require seismic analysis.

SECTION 7 - ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Condition

On the basis of the visual examination, the Guilford Lake Dam is considered to be in good condition. There were no signs of overall impending structural failure, but a concern exists relative to the condition of the apron, which may warrant prompt remedial action to prevent continued erosion which may lead to undermining of the spillway.

b. Adequacy of Information

The evaluation of this dam is based primarily on visual examination, approximate hydraulic and hydrologic computations, and application of engineering judgement. No information was available on the bearing materials on which the dam was built. However, the available information that was obtained is adequate for the purposes of a Phase I assessment.

c. Need for Additional Investigations

It is recommended that the following additional investigations be performed by a registered professional engineer engaged by the owner:

1. Conduct a detailed hydrologic and hydraulic analysis to more accurately determine the site specific characteristics of the watershed.

2. No design or construction data was available; therefore, attempt to obtain plans or details of the structure including the construction history and the nature and properties of foundation bearing materials as well as the materials behind the spillway. This data is necessary to implement Investigations 3 and 4 below. If no such data is available, it may be necessary to conduct subsurface explorations to obtain the information required for the appropriate assessments.

3. Perform a structural stability analysis on the dam using data obtained as a result of Investigation 2 that will assess the effect of the earth and rockfill behind the spillway on the overall stability of the spillway and recommend remedial measures, if necessary.

4. The concrete spillway apron was severely cracked and deteriorated; therefore, design a new concrete or

riprap apron for the spillway, and recommend an appropriate method to construct it.

d. Urgency

It is recommended that within 3 months of the final approval date of this report, all of the additional investigations should be initiated and within 18 months, appropriate remedial measures should be completed. In the interim, a plan for providing around-the-clock surveillance of the dam during periods of unusually heavy precipitation should be developed and implemented. The recommended corrective measures listed in Section 7.2 should be accomplished within 12 months of final approval.

7.2 RECOMMENDED MEASURES

It is considered important that the following items be accomplished in addition to any items required as a result of the additional investigations recommended in Section 7.1c:

a. Remove the fallen logs in the discharge channel and clear the brush and trees from the side slopes.

b. Repair the cracked 6 inch diameter gate valve on the water distribution pipe (reservoir drain).

c. Develop and implement a flood warning and emergency evacuation plan to alert downstream residents in the event conditions occur which could result in failure of the dam.

APPENDIX A

PHOTOGRAPHS

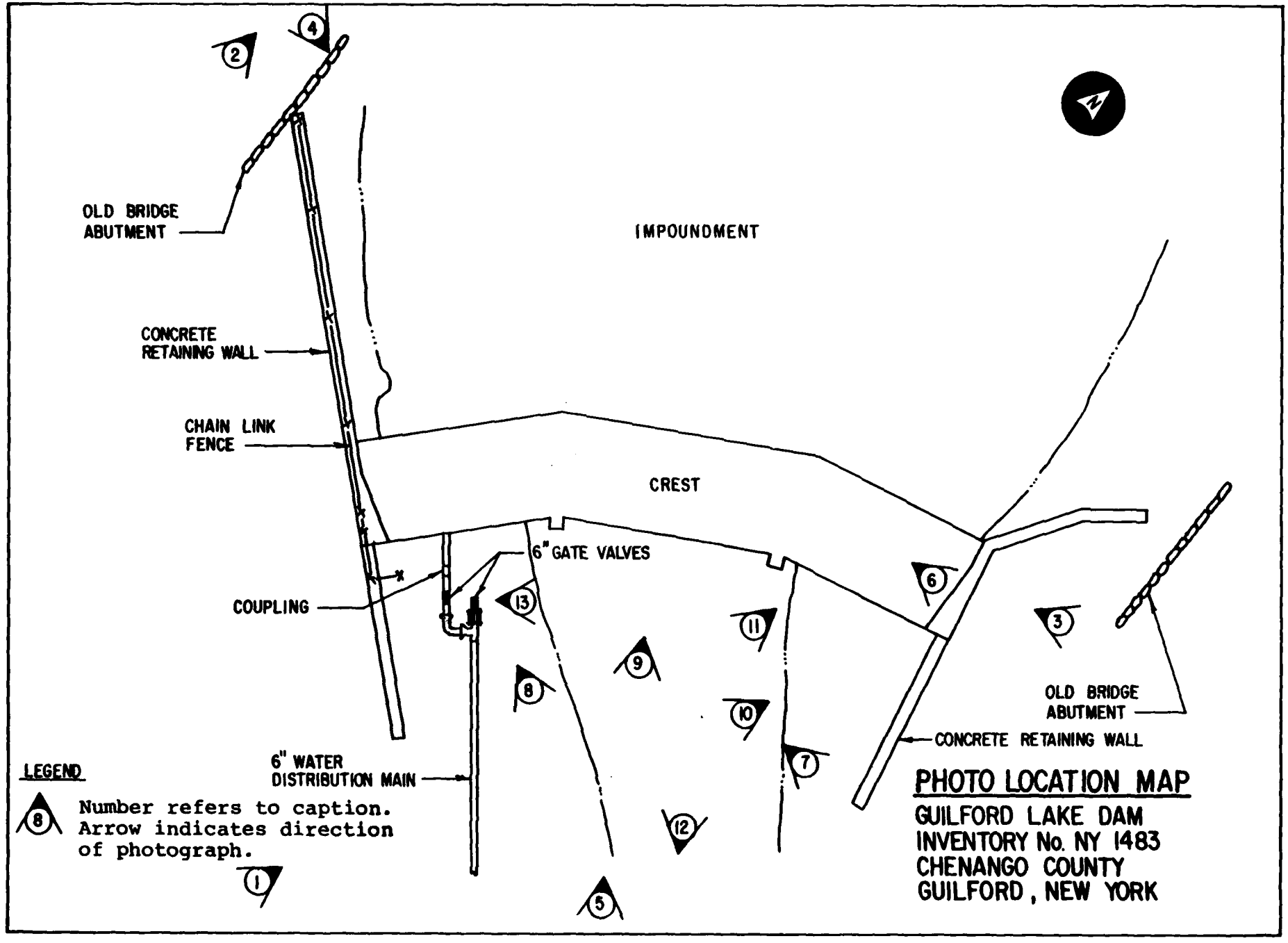

OLD BRIDGE ABUTMENT
IMPOUNDMENT
CONCRETE RETAINING WALL
CHAIN LINK FENCE
CREST
6" GATE VALVES
COUPLING
OLD BRIDGE ABUTMENT
CONCRETE RETAINING WALL
6" WATER DISTRIBUTION MAIN
LEGEND
Number refers to caption. Arrow indicates direction of photograph.
PHOTO LOCATION MAP
GUILFORD LAKE DAM
INVENTORY No. NY 1483
CHENANGO COUNTY
GUILFORD, NEW YORK

PHOTO #2: Overview of impoundment

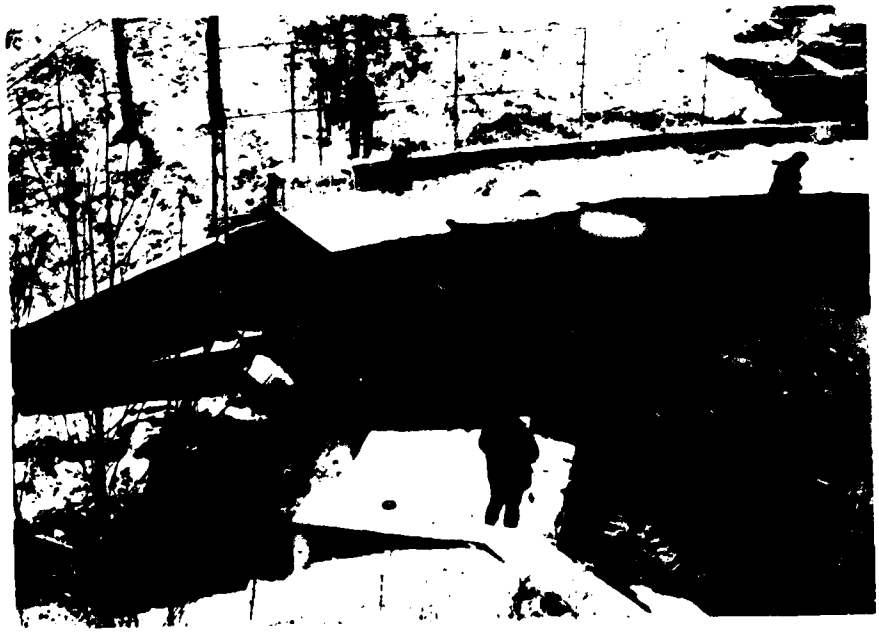


PHOTO #3: Crest of dam looking toward right abutment

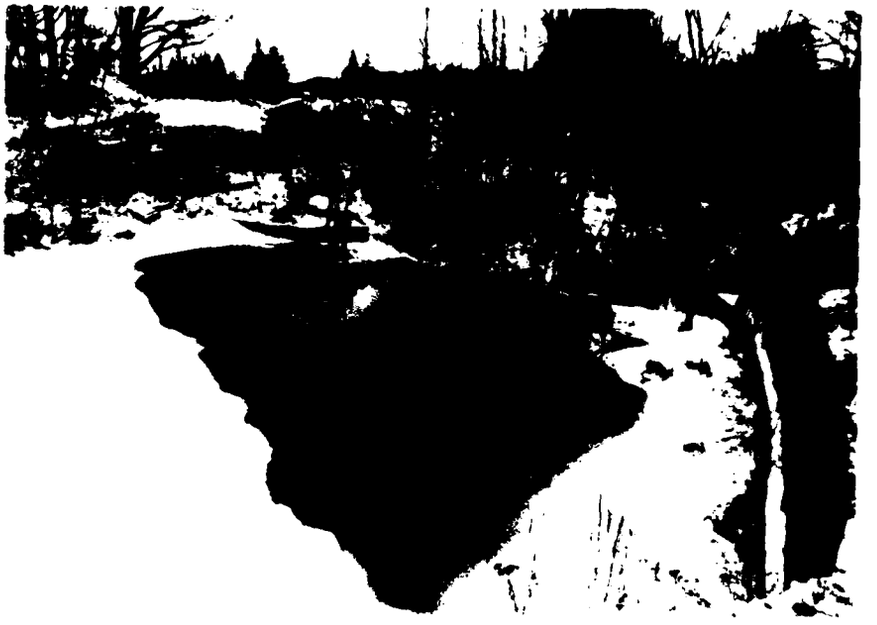


PHOTO #4: Overview of upstream face of dam

PHOTO #5: Overview of downstream face of dam

PHOTO #6: Upstream face of dam

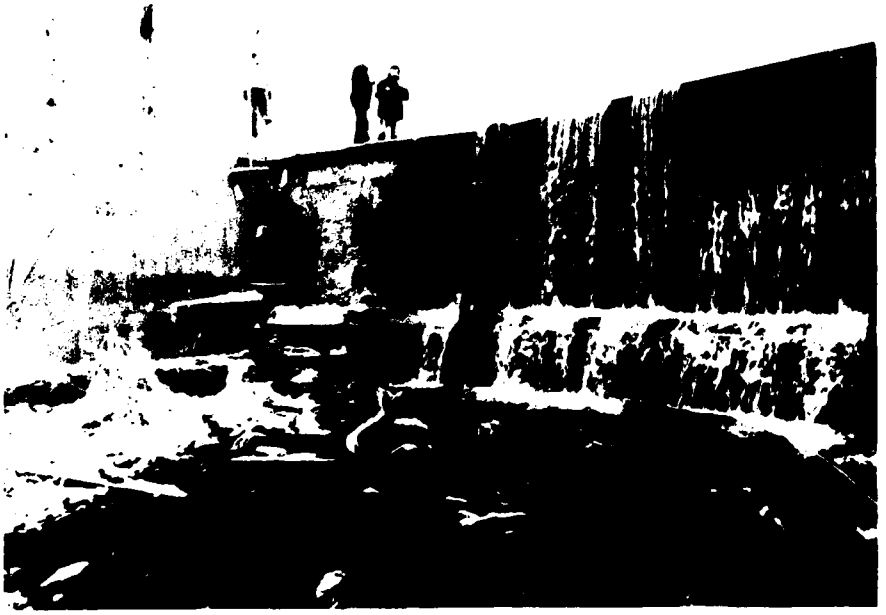


PHOTO #7: Downstream face of dam

PHOTO #8: Close-up of downstream face of dam at right abutment

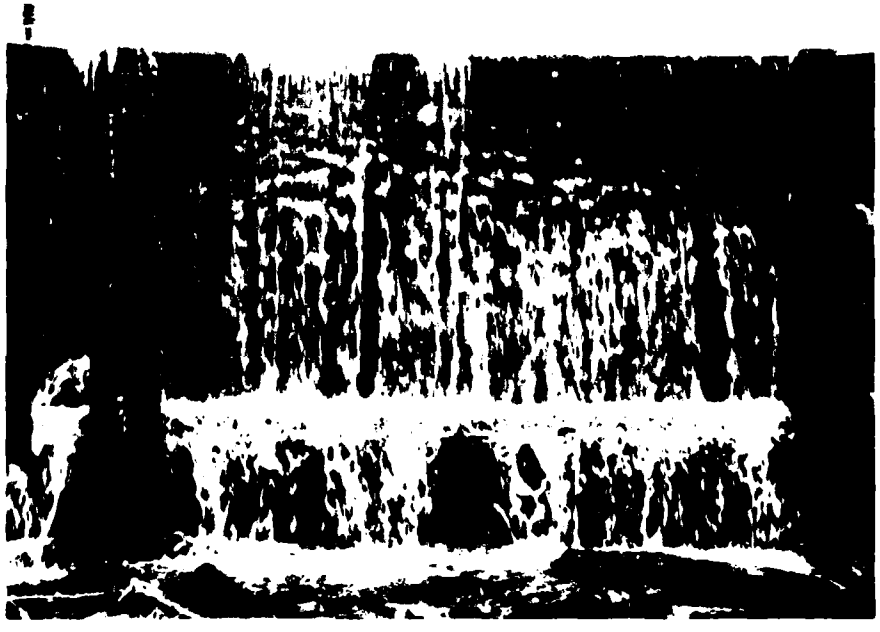


PHOTO #9: Close-up of downstream face at center of dam

PHOTO #10: Close-up of downstream face of dam at left abutment

PHOTO #11: Concrete apron (broken up) at downstream face of spillway

PHOTO #12: Downstream channel conditions

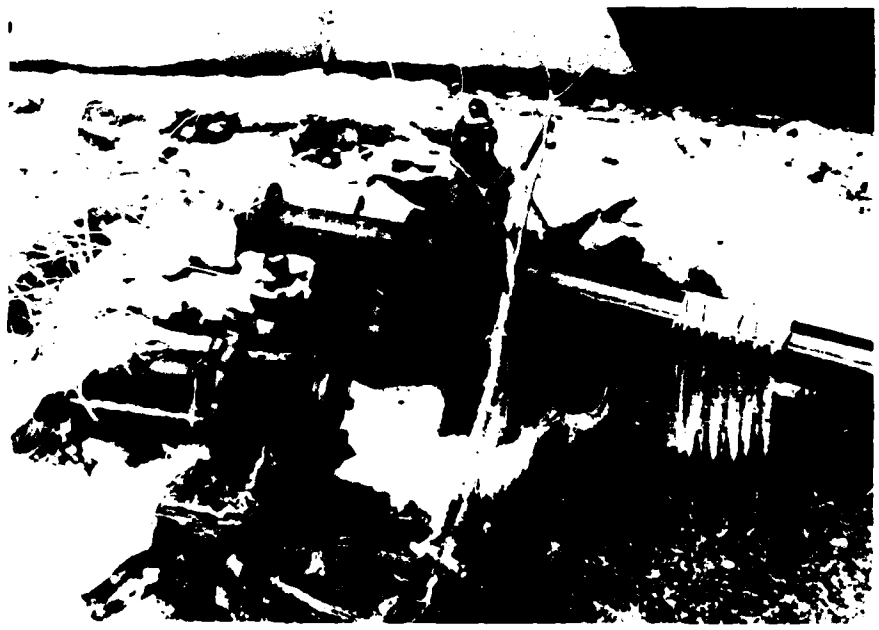


PHOTO #13: Water system appurtenances (6 inch diameter water main and two six inch water valves - one with a split casing)

APPENDIX B

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam Guilford Lake Dam

Fed. I.D. # NY 1483 **DEC Dam No.** 118A-4464

River Basin Susquehanna

Location: Town Guilford **County** Chenango

Stream Name Guilford Creek

Tributary of Unadilla River

Latitude (N) 42° - 24.6' **Longitude (W)** 75° - 29.8'

Type of Dam Stone and concrete gravity

Hazard Category High

Date(s) of Inspection March 12 and 14, 1981

Weather Conditions Overcast, 35° ± F.

Reservoir Level at Time of Inspection Elevation 1558.1 ± (NGVD)

b. Inspection Personnel

R.C. Smith, T.L. Ward & R.A. Criscuolo of Flaherty Giavara Associates, P.C.; P.L. LeCount & J.J. Rixner of Haley & Aldrich, Inc.; E. Thomas of Salmon Associates

c. Persons Contacted (Including Address & Phone No.)

Clifford E. Wade, Supervisor
Town of Guilford
R.D. 1 - Box 103
Guilford, New York 13780

d. History:

Date Constructed Prior to 1827 **Date(s) Reconstructed** 1978-1979

Designer Unknown

Constructed By Unknown

Owner Town of Guilford

2) **Embankment**

a. **Characteristics**

(1) **Embankment Material** Unknown

(2) **Cutoff Type** Unknown

(3) **Impervious Core** Unknown

(4) **Internal Drainage System** None observed

(5) **Miscellaneous** No comments

b. **Crest**

(1) **Vertical Alignment** Good; no cracks observed

(2) **Horizontal Alignment** Good; both the left and right sections of the spillway angle toward the center section

(3) **Surface Cracks** None observed

(4) **Miscellaneous** The spillway was recently (1978-1979) refaced

c. **Upstream Slope**

(1) **Slope (Estimate - V:H)** Unknown

(2) **Undesirable Growth or Debris, Animal Burrows** None observed

(3) **Sloughing, Subsidence or Depressions** None apparent

(4) **Slope Protection** Not applicable

(5) **Surface Cracks or Movement at Toe** None evident

d. **Downstream Slope**

(1) **Slope (Estimate - V:H)** 9:1

(2) **Undesirable Growth or Debris, Animal Burrows** None evident

(3) **Sloughing, Subsidence or Depressions** None observed

(4) **Surface Cracks or Movement at Toe** Concrete spillway apron is cracked, broken and deteriorated

(5) **Seepage** None apparent

(6) **External Drainage System (Ditches, Trenches, Blanket)** None observed

(7) **Condition Around Outlet Structure** See d.(4) above

(8) **Seepage Beyond Toe** None evident

e. **Abutments - Embankment Contact**

Right: good condition

Left: good condition

(1) **Erosion at Contact** None apparent

(2) **Seepage Along Contact** None observed

3) **Drainage System**

a. **Description of System** Broad-crested concrete weir and discharge conveyance channel excavated into earth

b. **Condition of System** Good; except for the deteriorated concrete apron

c. **Discharge from Drainage System** Approximately 14 foot drop from weir to discharge channel (See sketch in Appendix G)

4) **Instrumentation** (Monumentation/Surveys, Observation Wells, Weirs, Peizometers, Etc.)

None observed

5) **Reservoir**

a. **Slopes** Moderate valley slopes with Chenango County Road 35 following the south edge of the impoundment

b. **Sedimentation** Possible accumulation of sediment behind the dam

c. **Unusual Conditions Which Affect Dam** None noted

6) **Area Downstream of Dam**

a. **Downstream Hazard (No. of Homes, Highways, etc.)** Approximately 10 buildings and two roads are within the dam failure flood hazard area

b. **Seepage, Unusual Growth** None observed

c. **Evidence of Movement Beyond Toe of Dam** None evident

d. ***Condition of Downstream Channel*** Good; presently stable, no aggradation or degradation

7) **Spillway(s) (Including Discharge Conveyance Channel)**

Principal spillway and discharge conveyance channel

a. **General** Principal spillway and discharge conveyance channel handle all flows

b. **Condition of Principal Spillway** Good; no signs of deterioration except for the concrete apron which is cracked and broken

c. **Condition of Emergency Spillway** Not applicable

d. **Condition of Discharge Conveyance Channel** Good condition, presently stable

8) **Reservoir Drain/Outlet**

Type: Pipe X Conduit _____ Other _____

Material: Concrete _____ Metal Cast iron Other _____

Size: 6 inch **Length** Unknown

Invert Elevations: Entrance Unknown Exit Unknown

Physical Condition (Describe): Unobservable _____

Material: Cast iron

Joints: Mechanical and push-on **Alignment** _____

Structural Integrity: Good; except there was a crack in the casing of one of the 6 inch gate valves

Hydraulic Capability: Good; the primary purpose of the pipe is for water supply and distribution for the Town of Guilford

Means of Control: Gate _____ Valve 6 inch gate valve Uncontrolled _____

Operation: Operable X Inoperable _____ Uncontrolled _____

Present Condition (Describe): Good; except for the crack noted above

9) **Structural**

a. **Concrete Surfaces** Concrete of the spillway is generally in good condition; however, the concrete apron is cracked, broken and deteriorated

b. **Structural Cracking** No evidence of any structural cracks

c. **Movement - Horizontal & Vertical Alignment (Settlement)** None observed

d. **Junctions with Abutments or Embankments** Concrete abutments at both ends of the spillway are in good condition.

e. **Drains - Foundation, Joint, Face** None evident

f. **Water Passages, Conduits, Sluices** None observed

g. **Seepage or Leakage** No signs of seepage or leakage

h. **Joints - Construction, etc.** Good condition

i. **Foundation** Inaccessible

j. **Abutments** See 9) d. above

k. **Control Gates** None observed

l. **Approach & Outlet Channels** Not applicable

m. **Energy Dissipators (Plunge Pool, etc.)** None observed

n. **Intake Structures** Not applicable

o. **Stability** Appears to be stable

p. **Miscellaneous** No comments

10) Appurtenant Structures (Power House, Lock, Gatehouse, Other)

a. Description and Condition None observed

APPENDIX C

HYDROLOGIC/HYDRAULIC ENGINEERING DATA AND COMPUTATIONS

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

AREA-CAPACITY DATA:

	Elevation (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
1) Top of Dam	1560.2	84	560
2) Design High Water (Max. Design Pool)	--	--	--
3) Emergency Spillway Crest	--	--	--
4) Pool Level with Flashboards	--	--	--
5) Principal Spillway Crest	1558.0	74	390

DISCHARGES:

	Volume (cfs)
1) Average Daily	Unknown
2) Emergency Spillway @ Maximum High Water (Top of Dam)	451
3) Emergency Spillway @ Design High Water	--
4) Principal Spillway @ Emergency Spillway Crest	--
5) Low Level Outlet @ Principal Spillway Crest	--
6) Total (of all facilities) @ Maximum High Water	451
7) Maximum Known Flood	Unknown
8) At Time of Inspection	2±

CREST: **ELEVATION:** 1560.2 (NGVD)

Type Concrete

Width 8.3 feet **Length** 62 feet

Spillover Concrete spillway weir

Location Right abutment

SPILLWAY:

PRINCIPAL		EMERGENCY
1558.0 (NGVD)	Elevation	
Broad-crested weir	Type	
8.3 feet	Width	
	Type of Control	
Weir	Uncontrolled	
--	Controlled	
None	Type: (Flashboards; gate)	
One	Number	
43.5 foot long weir	Size/Length	
Concrete	Invert Material	
Continuously	Anticipated Length of Operating Service	
Unknown	Chute Length	
Unknown	Height Between Spillway Crest & Approach Channel Invert (Weir Flow)	

Type:

Location:

Records:

Date Unknown

Max. Reading Unknown

FLOOD WATER CONTROL SYSTEM:

Warning System None in effect

Method of Controlled Releases (mechanisms) One 6 inch gate valve is used to control the flow of water to the distribution system; the other may be used as a reservoir drain.

DRAINAGE AREA: 1430 acres = 2.23 square miles

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type Rural, agriculture

Terrain - Relief Rolling uplands

Surface - Soil Glacial till

Runoff Potential (existing or planned extensive alterations to existing surface or subsurface conditions)

Primarily open fields with scattered woodlands; glacial till soils; average watershed slope is 5 percent; a number of residential homes (Guilford) and roadways.

Potential Sedimentation problem areas (natural or man-made; present or future)

Possible surface erosion from agricultural fields during fallow periods

Potential Backwater problem areas for levels at maximum storage capacity including surcharge storage:

None

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the reservoir perimeter:

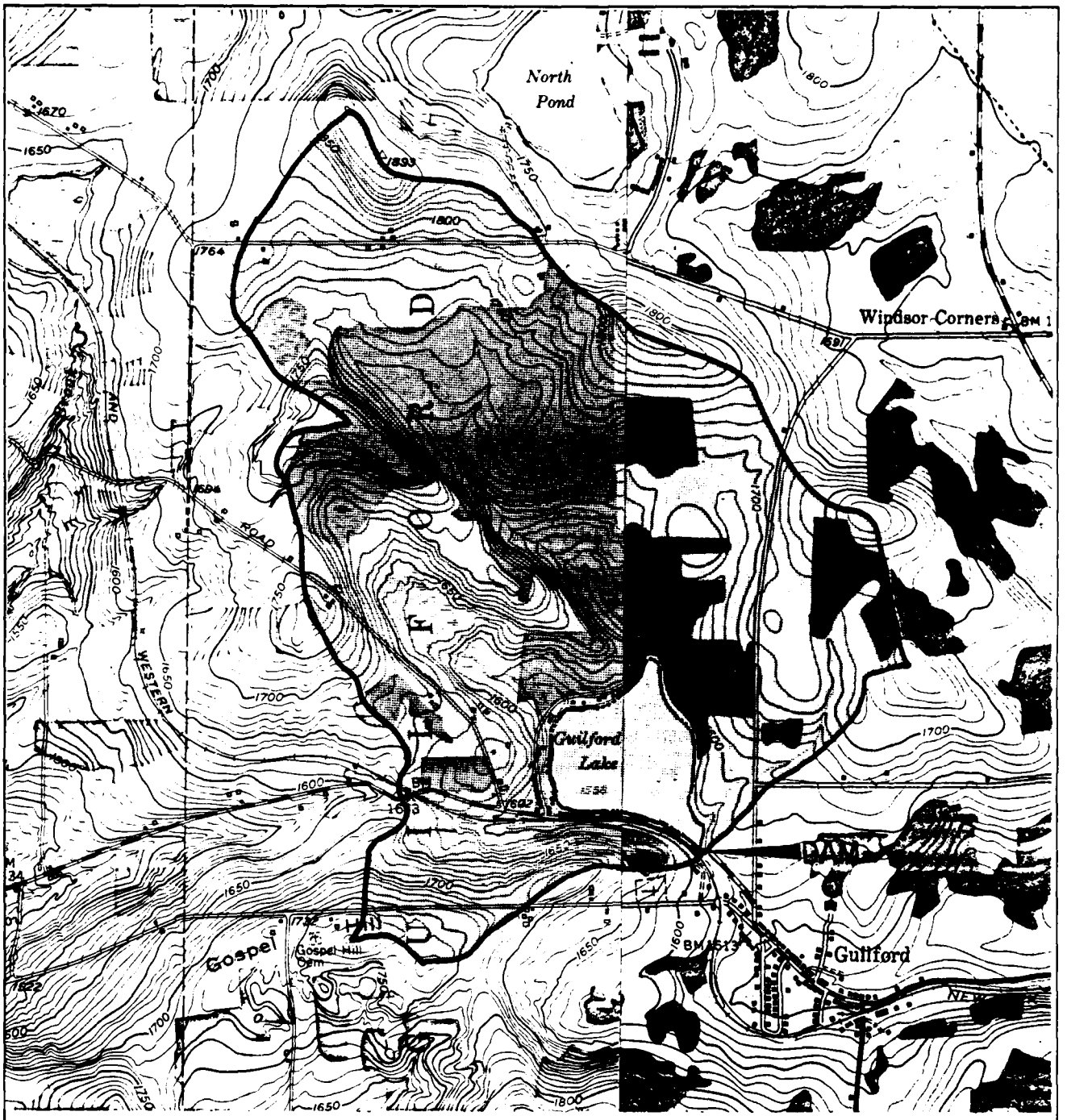
Location: None

Elevation:

Reservoir:

Length @ Maximum Pool 2700± feet = 0.5 miles **(Miles)**

Length of Shoreline (@ Spillway Crest) 7800± feet = 1.5 miles **(Miles)**



WATERSHED MAP

GUILFORD LAKE DAM
INVENTORY No. NY 1483

SUSQUEHANNA RIVER BASIN
CHENANGO COUNTY
GUILFORD, NEW YORK

FLAHERTY · GIAVARA ASSOCIATES, P.C.

CALCULATIONS

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN 06510/203/789-1260

WATERSHED DATA FOR HEC-1 SNYDER HYDROGRAPH

1) Time To Peak (T_P)

$L = 10{,}000$ ft $= 1.89$ miles
$L_C = 3{,}500$ ft $= 0.66$ miles
$C_T = 2.0$ for average slopes

$$T_P = C_T (L L_C)^{0.3}$$
$$= 2.0 (1.89 \times 0.66)^{0.3} = 2.14 \text{ HOURS}$$

$$t_r = \frac{t_p}{5.5} = \frac{2.14}{5.5} = 0.39 \quad \text{USE } t_R = 0.5$$

$$t_{pR} = t_p + 0.25 (t_R - t_r)$$
$$= 2.14 + 0.25 (0.5 - 0.39) = 2.17 \text{ HOURS}$$

2) $C_p = 0.63$ for Highland Area

3) % Impervious

ROADS - 23,000 LF $\times$ 25' = 575,000 ft^2
HOUSES - ± 70 @ 1000 ft^2 = 70,000 ft^2
645,000 ft^2

645,000 ft^2 = 14.8 ACRES

$$\frac{14.8 \text{ ACRES}}{1429.8 \text{ ACRES}} = 1.0\%$$

4) WATERSHED AREA

1429.8 ACRES / 640 = 2.23 Square Miles

BASED ON 1" = 2000' USGS map

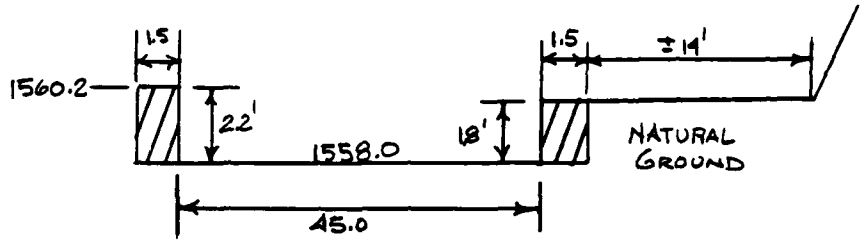
FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

5) Rainfall Data - (From Hydrometeorological Report No. 33)

24 Hr PMP = 20.3 inches for 200 square miles

Duration (Hrs)	Adj Factor %
6	111
12	122
24	133
48	143

STAGE DISCHARGE DATA



STAGE	$Q = 3LH^{1.5}$	$Q = 2.5LH^{1.5}$	DISCHARGE
1558.0	0	–	0
1558.5	$3(45)(.5)^{1.5}$	–	47.7
1559.0	$3(45)(1)$	–	135.0
1559.5	$3(45)(1.5)^{1.5}$	–	248.0
1559.8	$3(45)(1.8)^{1.5}$	–	326.0
1560.0	$3(45)(2)^{1.5} + 3(1.5)(.2)^{1.5}$	$2.5(14)(.2)^{1.5}$	385.4
1560.2	$3(45)(2.2)^{1.5} + 3(1.5)(.4)^{1.5}$	$2.5(14)(.4)^{1.5}$	450.5
1560.5	$3(45)(2.5)^{1.5} + 3(1.5)(.7)^{1.5} + 3(1.5)(.3)^{1.5}$	$2.5(14)(.7)^{1.5}$	557.5
1561.0	$3(45)(3)^{1.5} + 3(1.5)(1.2)^{1.5} + 3(1.5)(.8)^{1.5}$	$2.5(14)(1.2)^{1.5}$	756.6
1570.0	$3(45)(12)^{1.5} + 3(1.5)(10.2)^{1.5} + 3(1.5)(9.8)^{1.5}$	$2.5(14)(10.2)^{1.5}$	7036.7

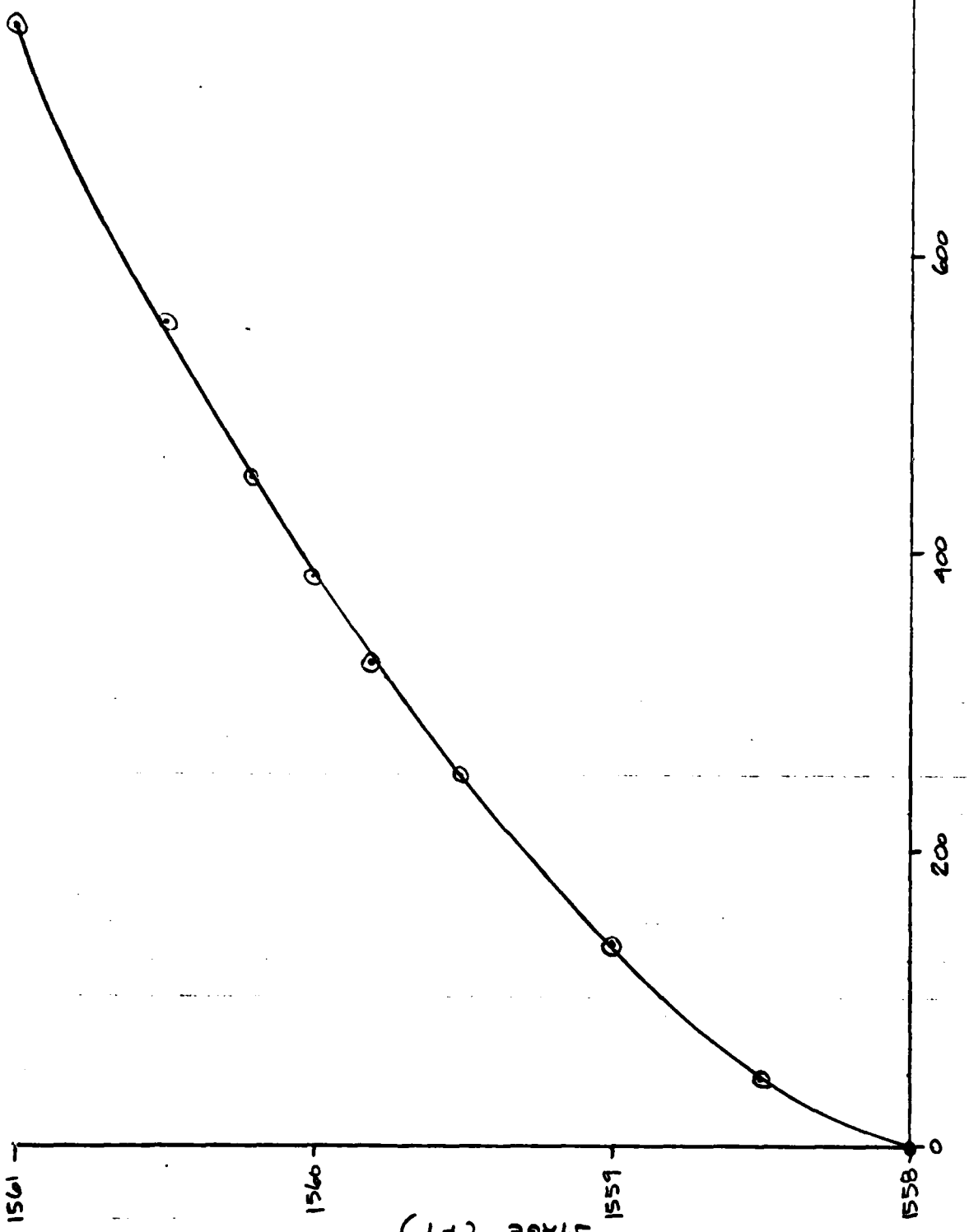
PROJECT Corps Dams
- YY 1983

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN 06510/203/789-1260

SHEET NO. 4 OF 5
BY RAC DATE 4-7-81
CHK'D. BY TLW DATE 6-23-81

Stage Discharge Curve

Spillway Section



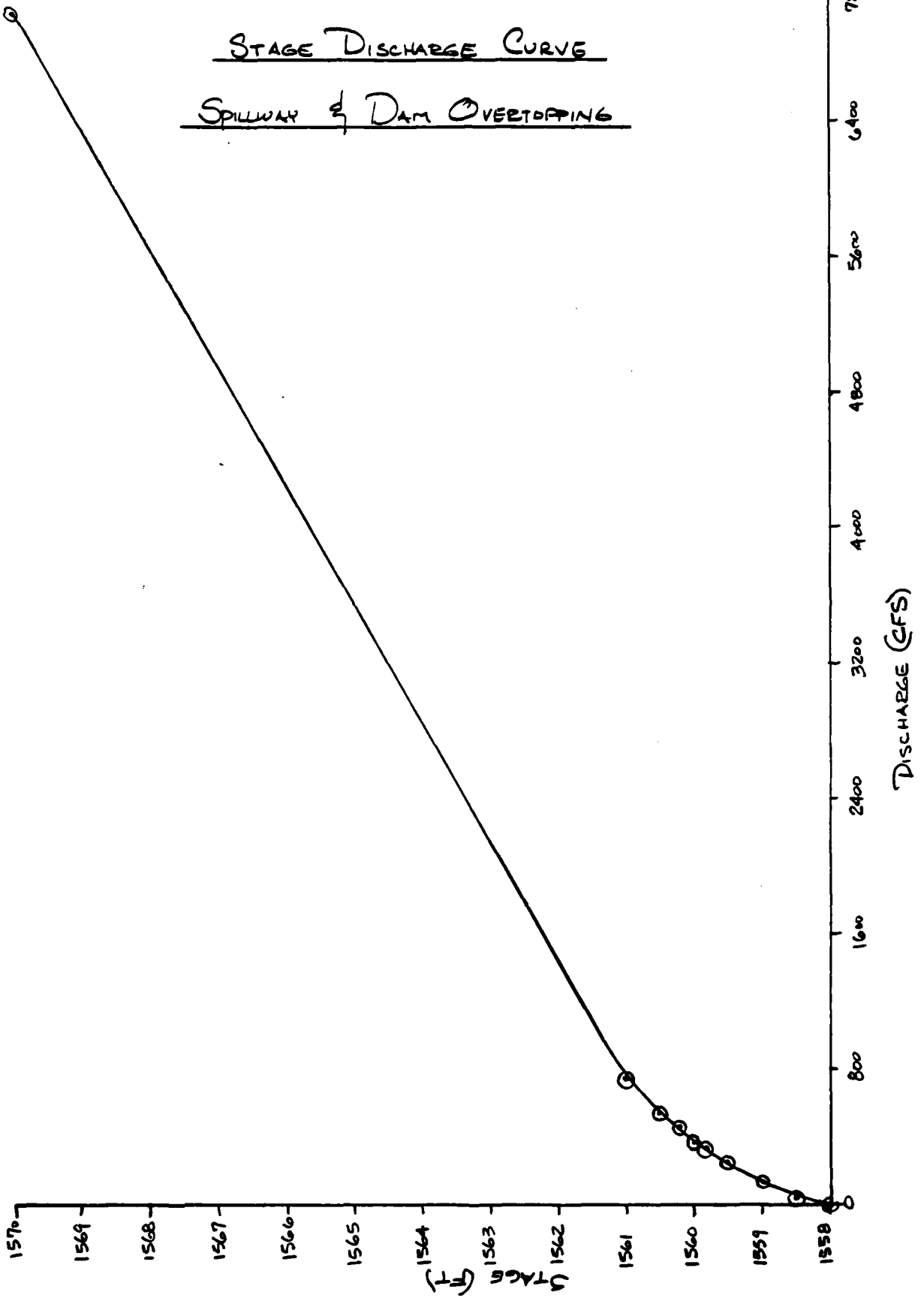
PROJECT Corps Dams
– Guilford Lake Dam
NY 1983

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA. NEW HAVEN. CONN 06510/203/789-1260

SHEET NO. 5 OF 5
BY RAC DATE 5-8-81
CHK'D. BY TLW DATE 6-23-81

Stage Discharge Curve

Spillway & Dam Overtopping



HEC-1 FLOOD HYDROGRAPH COMPUTATIONS

```
FLAHERTY GIAVARA ASSOCIATES, P.C.
**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********************************
     1                A1 NATIONAL DAM INSPECTION PROGRAM, PHASE I REPORT, CORPS OF ENGINEERS - NEW YORK DISTRICT
     2                A2 DAM INVENTORY NO. NY 1483, GUILFORD LAKE DAM, CHENANGO COUNTY, NEW YORK, APRIL 7, 1981
     3                A3 PREPARED BY FLAHERTY GIAVARA ASSOCIATES, P.C., ONE COLUMBUS PLAZA, NEW HAVEN, CONNECTICUT
     4                B   120       0      30       0       0       0       0       2       0       0
     5                B1    5
     6                J     1       9       1
     7                J1  0.10    0.15    0.16    0.17    0.18    0.19    0.20    0.50    1.00
     8                K     0       1               0       0       1       0
     9                K1 INFLOW HYDROGRAPH - SNYDER METHOD
    10                M     1       1    2.23       0       0                       1
    11                P     0    20.3     111     122     133     143
    12                T                                                1     0.1             0.01
    13                W  2.17    0.63
    14                X  -2.0   -0.10     1.5
    15                R     1       1               0       1       1       0
    16                K1  RESERVOIR ROUTING - MODIFIED PLUS METHOD
    17                Y                       1       1
    18                Y1    1                                         0      -1
    19                Y41558.0  1558.5  1559.0  1559.5  1557.8  1560.0  1560.2  1560.5  1561.0  1570.0
    20                Y5     0    47.7   135.0   248.0   326.0   382.2   441.7   537.7   710.6  5896.5
    21                $A  73.5    83.6   124.0
    22                $E1558.0  1560.0  1580.0
    23                $$1558.0
    24                $D1560.2     2.5     1.5    14.0
    25                K    99

                          PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS
                                  RUNOFF HYDROGRAPH AT          1
                                  ROUTE HYDROGRAPH TO           1
                                  END OF NETWORK

**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********************************

RUN  DATE: 8/21/
     TIME: 6:39 AM

                      NATIONAL DAM INSPECTION PROGRAM, PHASE I REPORT, CORPS OF ENGINEERS - NEW YORK DISTRICT
                      DAM INVENTORY NO. NY 1483, GUILFORD LAKE DAM, CHENANGO COUNTY, NEW YORK, APRIL 7, 1981
                      PREPARED BY FLAHERTY GIAVARA ASSOCIATES, P.C., ONE COLUMBUS PLAZA, NEW HAVEN, CONNECTICUT

                                          JOB SPECIFICATION
                      NQ      NHR     NMIN     IDAY     IHR     IMIN    METRC    IPLT    IPRT   NSTAN
                     120       0       30        0       0        0        0       2       0       0
                                       JOPER     NWT   LROPT   TRACE
                                           5       0       0       0

                                  MULTI-PLAN ANALYSES TO BE PERFORMED
```

NPLAN= 1 NRTIO= 9 LRTIO= 1
RTIOS= 0.10 0.15 0.16 0.17 0.18 0.19 0.20 0.50 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH - SNYDER METHOD

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	2.23	0.00	2.23	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	20.30	111.00	122.00	133.00	143.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.01

UNIT HYDROGRAPH DATA
TP= 2.17 CP=0.63 NTA= 0

RECESSION DATA
STRTQ= -2.00 QRCSN= -0.10 RTIOR= 1.50

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 5.17 AND R= 3.90 INTERVALS

UNIT HYDROGRAPH 24 END-OF-PERIOD ORDINATES, LAG= 2.19 HOURS, CP= 0.64 VOL= 1.00

39.	142.	271.	379.	413.	369.	288.	223.	172.	133.	
103.	79.	61.	47.	37.	28.	22.	17.	13.	10.	
8.	6.	5.	4.							

O MO. DA	HR. MN	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLOW COMP Q	MO. DA	HR. MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	0.30	1	0.00	0.00	0.00	4.	1.02	6.30	61	0.15	0.10	0.05	31.
1.01	1.00	2	0.00	0.00	0.00	4.	1.02	7.00	62	0.15	0.10	0.05	44.
1.01	1.30	3	0.00	0.00	0.00	4.	1.02	7.30	63	0.15	0.10	0.05	68.
1.01	2.00	4	0.00	0.00	0.00	4.	1.02	8.00	64	0.15	0.10	0.05	102.
1.01	2.30	5	0.00	0.00	0.00	4.	1.02	8.30	65	0.15	0.10	0.05	139.
1.01	3.00	6	0.00	0.00	0.00	4.	1.02	9.00	66	0.15	0.10	0.05	172.
1.01	3.30	7	0.00	0.00	0.00	3.	1.02	9.30	67	0.15	0.10	0.05	198.
1.01	4.00	8	0.00	0.00	0.00	3.	1.02	10.00	68	0.15	0.10	0.05	218.
1.01	4.30	9	0.00	0.00	0.00	3.	1.02	10.30	69	0.15	0.10	0.05	234.
1.01	5.00	10	0.00	0.00	0.00	3.	1.02	11.00	70	0.15	0.10	0.05	246.
1.01	5.30	11	0.00	0.00	0.00	3.	1.02	11.30	71	0.15	0.10	0.05	255.
1.01	6.00	12	0.00	0.00	0.00	3.	1.02	12.00	72	0.15	0.10	0.05	262.
1.01	6.30	13	0.01	0.00	0.01	3.	1.02	12.30	73	0.90	0.85	0.05	297.
1.01	7.00	14	0.01	0.00	0.01	3.	1.02	13.00	74	0.90	0.85	0.05	408.
1.01	7.30	15	0.01	0.00	0.01	3.	1.02	13.30	75	1.08	1.03	0.05	622.
1.01	8.00	16	0.01	0.00	0.01	3.	1.02	14.00	76	1.08	1.03	0.05	933.
1.01	8.30	17	0.91	0.90	0.01	2.	1.02	14.30	77	1.35	1.30	0.05	1305.
1.01	9.00	18	0.01	0.00	0.01	2.	1.02	15.00	78	1.35	1.30	0.05	1690.

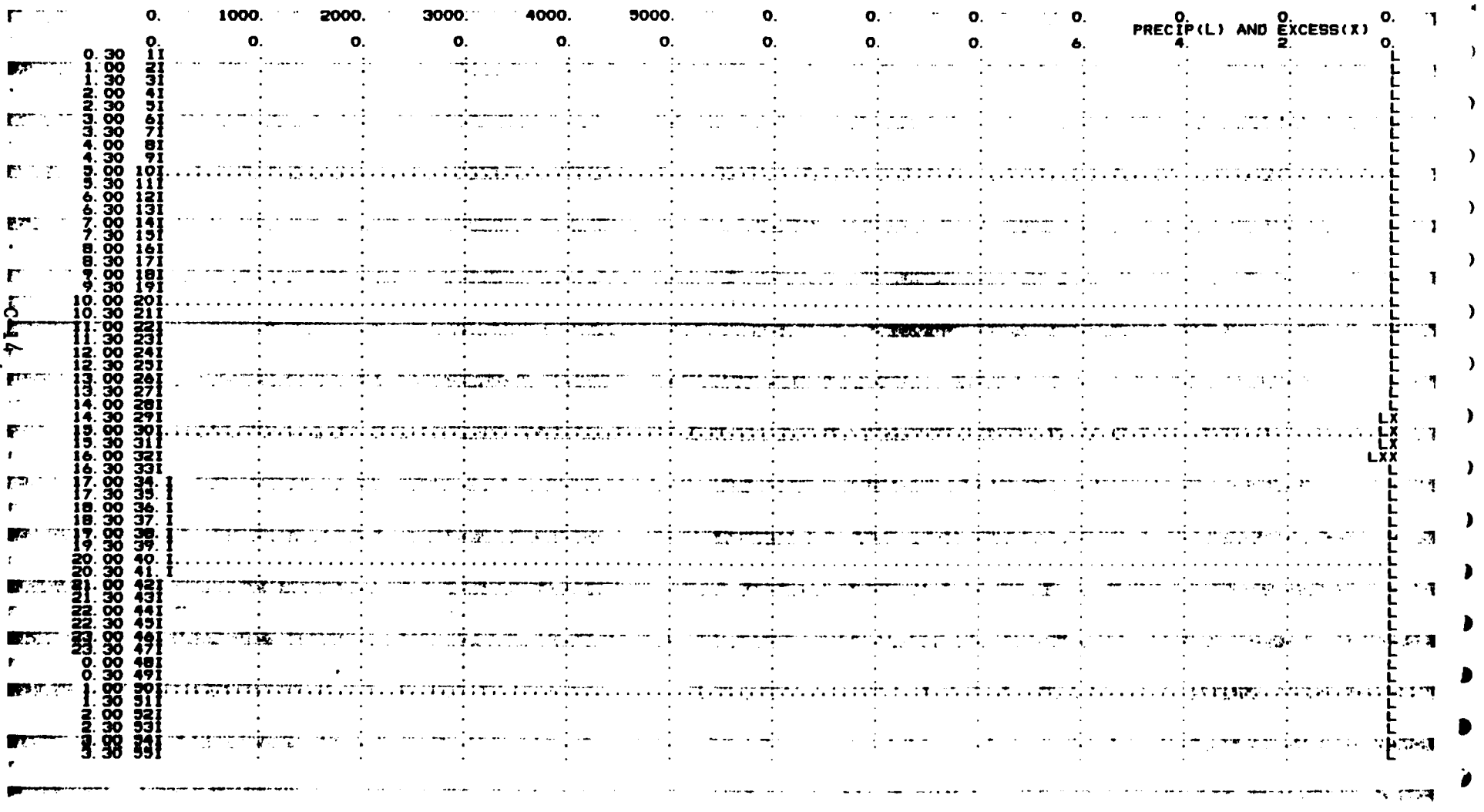
1.01	9.30	19	0.01	0.00	0.01	2.	1.02	15.30	79	1.64	1.59	0.05	2067.
1.01	10.00	20	0.01	0.00	0.01	2.	1.02	16.00	80	5.21	5.16	0.05	2585.
1.01	10.30	21	0.01	0.00	0.01	2.	1.02	16.30	81	1.26	1.21	0.05	3307.
1.01	11.00	22	0.01	0.00	0.01	2.	1.02	17.00	82	1.26	1.21	0.05	4064.
1.01	11.30	23	0.01	0.00	0.01	2.	1.02	17.30	83	0.99	0.94	0.05	4629.
1.01	12.00	24	0.01	0.00	0.01	2.	1.02	18.00	84	0.99	0.94	0.05	4833.
1.01	12.30	25	0.07	0.00	0.07	2.	1.02	18.30	85	0.09	0.04	0.05	4605.
1.01	13.00	26	0.07	0.00	0.07	2.	1.02	19.00	86	0.09	0.04	0.05	4096.
1.01	13.30	27	0.08	0.00	0.08	2.	1.02	19.30	87	0.09	0.04	0.05	3514.
1.01	14.00	28	0.08	0.00	0.08	2.	1.02	20.00	88	0.09	0.04	0.05	2900.
1.01	14.30	29	0.10	0.00	0.10	2.	1.02	20.30	89	0.09	0.04	0.05	2314.
1.01	15.00	30	0.10	0.00	0.10	3.	1.02	21.00	90	0.09	0.04	0.05	1817.
1.01	15.30	31	0.12	0.00	0.12	3.	1.02	21.30	91	0.09	0.04	0.05	1430.
1.01	16.00	32	0.39	0.18	0.21	10.	1.02	22.00	92	0.09	0.04	0.05	1131.
1.01	16.30	33	0.09	0.05	0.05	31.	1.02	22.30	93	0.09	0.04	0.05	899.
1.01	17.00	34	0.09	0.05	0.05	60.	1.02	23.00	94	0.09	0.04	0.05	721.
1.01	17.30	35	0.07	0.03	0.05	90.	1.02	23.30	95	0.09	0.04	0.05	583.
1.01	18.00	36	0.07	0.03	0.05	111.	1.03	0.00	96	0.09	0.04	0.05	482.
1.01	18.30	37	0.01	0.00	0.01	115.	1.03	0.30	97	0.00	0.00	0.00	463.
1.01	19.00	38	0.01	0.00	0.01	105.	1.03	1.00	98	0.00	0.00	0.00	444.
1.01	19.30	39	0.01	0.00	0.01	91.	1.03	1.30	99	0.00	0.00	0.00	427.
1.01	20.00	40	0.01	0.00	0.01	75.	1.03	2.00	100	0.00	0.00	0.00	410.
1.01	20.30	41	0.01	0.00	0.01	60.	1.03	2.30	101	0.00	0.00	0.00	394.
1.01	21.00	42	0.01	0.00	0.01	46.	1.03	3.00	102	0.00	0.00	0.00	378.
1.01	21.30	43	0.01	0.00	0.01	36.	1.03	3.30	103	0.00	0.00	0.00	362.
1.01	22.00	44	0.01	0.00	0.01	28.	1.03	4.00	104	0.00	0.00	0.00	348.
1.01	22.30	45	0.01	0.00	0.01	22.	1.03	4.30	105	0.00	0.00	0.00	335.
1.01	23.00	46	0.01	0.00	0.01	17.	1.03	5.00	106	0.00	0.00	0.00	321.
1.01	23.30	47	0.01	0.00	0.01	13.	1.03	5.30	107	0.00	0.00	0.00	309.
1.02	0.00	48	0.01	0.00	0.01	11.	1.03	6.00	108	0.00	0.00	0.00	296.
1.02	0.30	49	0.06	0.01	0.05	11.	1.03	6.30	109	0.00	0.00	0.00	285.
1.02	1.00	50	0.06	0.01	0.05	10.	1.03	7.00	110	0.00	0.00	0.00	273.
1.02	1.30	51	0.06	0.01	0.05	10.	1.03	7.30	111	0.00	0.00	0.00	262.
1.02	2.00	52	0.06	0.01	0.05	12.	1.03	8.00	112	0.00	0.00	0.00	252.
1.02	2.30	53	0.06	0.01	0.05	16.	1.03	8.30	113	0.00	0.00	0.00	242.
1.02	3.00	54	0.06	0.01	0.05	19.	1.03	9.00	114	0.00	0.00	0.00	232.
1.02	3.30	55	0.06	0.01	0.05	21.	1.03	9.30	115	0.00	0.00	0.00	223.
1.02	4.00	56	0.06	0.01	0.05	23.	1.03	10.00	116	0.00	0.00	0.00	214.
1.02	4.30	57	0.06	0.01	0.05	24.	1.03	10.30	117	0.00	0.00	0.00	206.
1.02	5.00	58	0.06	0.01	0.05	25.	1.03	11.00	118	0.00	0.00	0.00	198.
1.02	5.30	59	0.06	0.01	0.05	26.	1.03	11.30	119	0.00	0.00	0.00	190.
1.02	6.00	60	0.06	0.01	0.05	27.	1.03	12.00	120	0.00	0.00	0.00	182.
									SUM	23.22	19.55	3.67	61679.
										(590.)	(497.)	(93.)	(1746.55)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4833.	3389.	1223.	513.	61584.
CMS	137.	96.	35.	15.	1744.
INCHES		14.14	20.40	21.41	21.41
MM		359.07	518.28	543.76	543.76
AC-FT		1680.	2426.	2545.	2545.
THOUS CU M		2073.	2992.	3139.	3139.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)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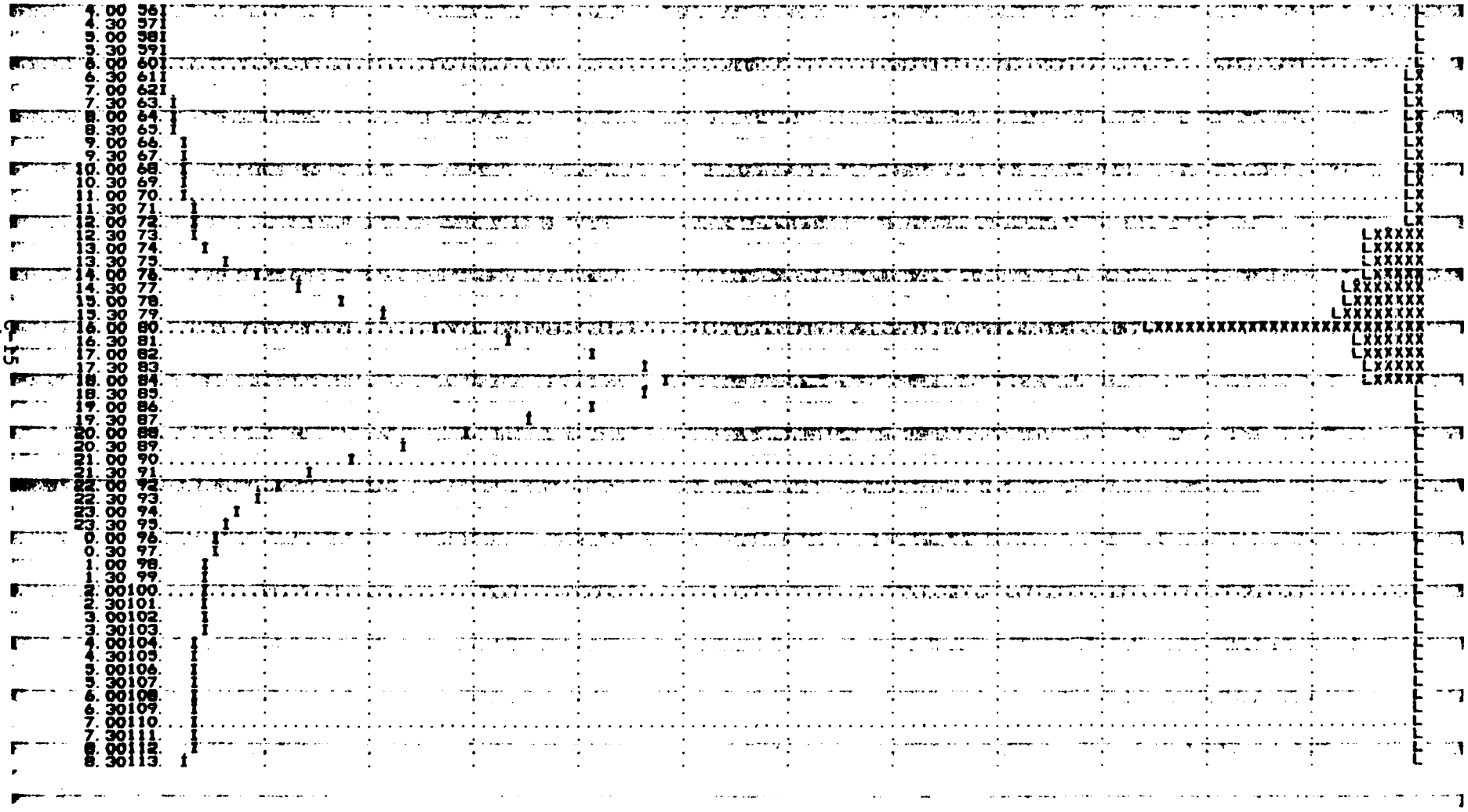
0.30 11
1.00 21
1.30 31
2.00 41
2.30 51
3.00 61
3.30 71
4.00 81
4.30 91
5.00 101
5.30 111
6.00 121
6.30 131
7.00 141
7.30 151
8.00 161
8.30 171
9.00 181
9.30 191
10.00 201
10.30 211
11.00 221
11.30 231
12.00 241
12.30 251
13.00 261
13.30 271
14.00 281
14.30 291
15.00 301
15.30 311
16.00 321
16.30 331
17.00 34. I
17.30 35. I
18.00 36. I
18.30 37. I
19.00 38. I
19.30 39. I
20.00 40. I
20.30 41. I
21.00 421
21.30 431
22.00 441
22.30 451
23.00 461
23.30 471
0.00 481
0.30 491
1.00 501
1.30 511
2.00 521
2.30 531
3.00 541
3.30 551


4.00 561
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6.30 611
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19.30 87
20.00 88
20.30 89
21.00 90
21.30 91
22.00 92
22.30 93
23.00 94
23.30 95
0.00 96
0.30 97
1.00 98
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6.00108
6.30109
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8.30113

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 9.30115. I
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10.30117. I
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12.00120. I
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OVN

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	3.	6.	9.	11.	11.	11.	9.	8.
6.	5.	4.	3.	2.	2.	1.	1.	1.	1.
1.	1.	2.	2.	2.	2.	2.	3.	3.	3.
3.	4.	7.	10.	14.	17.	20.	22.	23.	25.
29.	26.	30.	41.	62.	93.	130.	169.	207.	238.
331.	406.	463.	483.	460.	410.	351.	290.	231.	182.
143.	113.	90.	72.	58.	48.	46.	44.	43.	41.
39.	38.	36.	35.	33.	32.	31.	30.	28.	27.
26.	25.	24.	23.	22.	21.	21.	20.	19.	18.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	483.	339.	122.	51.	6158.
CMS	14.	10.	3.	1.	174.
INCHES		1.41	2.04	2.14	2.14
MM		35.91	51.83	54.38	54.38
AC-FT		168.	243.	254.	254.
THOUS CU M		207.	299.	314.	314.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

1.	1.	1.	1.	1.	1.	1.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	2.	5.	9.	14.	17.	17.	16.	14.	11.
9.	7.	5.	4.	3.	3.	2.	2.	2.	2.
2.	2.	2.	3.	3.	3.	4.	4.	4.	4.
5.	7.	10.	15.	21.	26.	30.	33.	35.	37.
38.	39.	45.	61.	93.	140.	196.	253.	310.	388.
478.	610.	694.	729.	691.	614.	527.	435.	347.	273.
214.	170.	135.	108.	87.	72.	69.	67.	64.	61.
59.	57.	54.	52.	50.	48.	46.	44.	43.	41.
39.	38.	36.	35.	33.	32.	31.	30.	28.	27.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	729.	508.	183.	77.	9238.
CMS	21.	14.	5.	2.	262.
INCHES		2.12	3.06	3.21	3.21
MM		53.86	77.74	81.56	81.56
AC-FT		252.	364.	382.	382.
THOUS CU M		311.	449.	471.	471.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

1.	1.	1.	1.	1.	1.	1.	1.	1.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	2.	5.	10.	14.	18.	18.	17.	15.	12.
10.	7.	6.	4.	3.	3.	2.	2.	2.	2.
2.	2.	3.	3.	3.	4.	4.	4.	4.	4.
5.	7.	11.	16.	22.	28.	32.	35.	37.	39.
41.	42.	48.	65.	100.	149.	209.	270.	331.	414.
329.	650.	741.	773.	737.	655.	562.	464.	370.	291.
229.	181.	144.	115.	93.	77.	74.	71.	68.	66.
63.	60.	58.	56.	54.	51.	49.	47.	46.	44.
42.	40.	39.	37.	36.	34.	33.	32.	30.	29.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	773.	542.	196.	82.	9853.
CMS	22.	15.	6.	2.	279.
INCHES		2.26	3.26	3.43	3.43
MM		57.45	82.92	87.00	87.00
AC-FT		269.	388.	407.	407.
THOUS CU M		332.	479.	502.	502.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	2.	5.	10.	15.	19.	20.	18.	16.	13.
10.	8.	6.	5.	4.	3.	2.	2.	2.	2.
2.	2.	3.	3.	4.	4.	4.	4.	4.	5.
5.	7.	12.	17.	24.	29.	34.	37.	40.	42.
43.	45.	50.	69.	106.	159.	222.	287.	351.	439.
562.	691.	787.	822.	783.	696.	597.	493.	393.	309.
243.	192.	153.	123.	99.	82.	79.	76.	73.	70.
67.	64.	62.	59.	57.	55.	52.	50.	48.	46.
45.	43.	41.	39.	38.	36.	35.	34.	32.	31.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	822.	576.	208.	87.	10469.
CMS	23.	16.	6.	2.	296.
INCHES		2.40	3.47	3.64	3.65
MM		61.04	88.11	92.44	92.44
AC-FT		286.	412.	433.	433.
THOUS CU M		352.	509.	534.	534.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	2.	5.	11.	16.	20.	21.	19.	16.	14.
11.	8.	6.	5.	4.	3.	2.	2.	2.	2.
2.	2.	3.	3.	4.	4.	4.	5.	5.	5.
6.	8.	12.	18.	25.	31.	36.	39.	42.	44.
46.	47.	53.	73.	112.	168.	235.	304.	372.	465.
595.	732.	833.	870.	829.	737.	632.	522.	417.	327.
257.	203.	162.	130.	109.	87.	83.	80.	77.	74.
71.	68.	65.	63.	60.	58.	56.	53.	51.	49.

47.	45.	44.	42.	40.	39.	37.	36.	34.	33.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	870.	610.	220.	92.	11085.
CMS	25.	17.	6.	3.	314.
INCHES		2.54	3.67	3.85	3.85
MM		64.63	93.29	97.88	97.88
AC-FT		302.	437.	458.	458.
THOUS CU M		373.	539.	565.	565.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
1.	2.	6.	11.	17.	21.	22.	20.	17.	14.
11.	9.	7.	5.	4.	3.	3.	2.	2.	2.
2.	2.	3.	4.	4.	4.	5.	5.	5.	5.
6.	8.	13.	19.	26.	33.	38.	41.	44.	47.
48.	50.	56.	77.	118.	177.	248.	321.	393.	491.
526.	772.	879.	918.	875.	778.	668.	551.	440.	345.
272.	215.	171.	137.	111.	92.	88.	84.	81.	78.
73.	72.	69.	66.	64.	61.	59.	56.	54.	52.
50.	48.	46.	44.	42.	41.	39.	38.	36.	35.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	918.	644.	232.	98.	11701.
CMS	26.	18.	7.	3.	331.
INCHES		2.69	3.88	4.07	4.07
MM		68.22	98.47	103.31	103.31
AC-FT		319.	461.	484.	484.
THOUS CU M		394.	568.	596.	596.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 7

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
1.	2.	6.	12.	18.	22.	23.	21.	18.	15.
12.	9.	7.	6.	4.	3.	3.	2.	2.	2.
2.	2.	3.	4.	4.	4.	5.	5.	5.	5.
6.	9.	14.	20.	28.	34.	40.	44.	47.	49.
51.	52.	59.	82.	124.	187.	261.	338.	413.	517.
661.	813.	926.	967.	921.	819.	703.	580.	463.	363.
280.	220.	180.	144.	117.	96.	83.	89.	85.	82.
79.	76.	73.	70.	67.	64.	62.	59.	57.	55.
52.	50.	48.	46.	45.	43.	41.	40.	38.	36.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	967.	678.	245.	103.	12317.
CMS	27.	19.	7.	3.	349.
INCHES		2.83	4.08	4.28	4.28
MM		71.81	103.66	108.75	108.75
AC-FT		336.	485.	509.	509.
THOUS CU M		419.	598.	628.	628.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 8

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	5.	15.	30.	45.	55.	57.	53.	46.	38.
30.	23.	18.	14.	11.	9.	7.	6.	5.	5.
5.	6.	8.	9.	11.	11.	12.	13.	13.	13.
15.	22.	34.	51.	70.	86.	99.	109.	117.	123.
127.	131.	148.	204.	311.	466.	652.	845.	1034.	1292.
1653.	2032.	2314.	2416.	2302.	2048.	1757.	1450.	1157.	908.
715.	565.	450.	360.	291.	241.	231.	222.	213.	205.
197.	189.	181.	174.	167.	161.	154.	148.	142.	137.
131.	126.	121.	116.	112.	107.	103.	99.	95.	91.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2416.	1694.	611.	257.	30792.
CMS	68.	48.	17.	7.	872.
INCHES		7.07	10.20	10.70	10.70
MM		179.53	259.14	271.88	271.88
AC-FT		840.	1213.	1272.	1272.
THOUS CU M		1036.	1496.	1569.	1569.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 9

4.	4.	4.	4.	4.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	3.
3.	10.	31.	60.	90.	111.	115.	105.	91.	75.
60.	46.	36.	28.	22.	17.	13.	11.	11.	10.
10.	12.	16.	19.	21.	23.	24.	25.	26.	27.
31.	44.	68.	102.	139.	172.	198.	218.	234.	246.
255.	262.	297.	408.	622.	933.	1309.	1690.	2067.	2389.
3307.	4064.	4629.	4833.	4605.	4096.	3514.	2900.	2314.	1817.
1430.	1131.	899.	721.	583.	482.	463.	444.	427.	410.
394.	378.	363.	348.	335.	321.	309.	296.	285.	273.
262.	252.	242.	232.	223.	214.	206.	198.	190.	182.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4833.	3389.	1223.	513.	61584.
CMS	137.	96.	35.	15.	1744.
INCHES		14.14	20.40	21.41	21.41
MM		359.07	518.28	543.76	543.76
AC-FT		1680.	2426.	2545.	2545.
THOUS CU M		2073.	2992.	3139.	3139.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

RESERVOIR ROUTING - MODIFIED PLUS METHOD

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	1	0	0	0	1	1	0	0

ROUTING DATA

GLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

```
                                    NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                                        1       0       0   0.000   0.000   0.000      0.      -1

         STAGE     1558.00    1558.50    1559.00    1559.50    1559.80    1560.00    1560.20    1560.50    1561.00    1570.00

          FLOW        0.00      47.70     135.00     248.00     326.00     382.20     441.70     537.70     710.60    5896.50

  SURFACE AREA=        74.        84.       124.

      CAPACITY=         0.       157.      2220.

     ELEVATION=      1558.      1560.      1580.

                                    CREL   SPWID    COQW    EXPW   ELEVL    COQL   CAREA    EXPL
                                  1558.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0

                                                          DAM DATA
                                               TOPEL    COQD    EXPD  DAMWID
                                              1560.2     2.5     1.5     14.

                                         STATION      1, PLAN 1, RATIO 1

                                      END-OF-PERIOD HYDROGRAPH ORDINATES

                                                    OUTFLOW
                   0.         0.         0.         0.         0.         0.         0.         0.         0.         0.
                   0.         0.         0.         0.         0.         0.         0.         0.         0.         0.
                   0.         0.         0.         0.         0.         0.         0.         0.         0.         0.
                   0.         0.         0.         0.         1.         1.         2.         2.         3.         3.
                   3.         3.         3.         3.         3.         3.         3.         3.         3.         3.
                   3.         2.         2.         2.         2.         2.         2.         2.         2.         2.
                   2.         2.         3.         3.         3.         4.         5.         6.         6.         7.
                   8.         7.        10.        11.        13.        17.        22.        28.        36.        40.
                  67.        94.       125.       161.       195.       222.       239.       248.       249.       244.
                 235.       224.       210.       196.       182.       167.       154.       142.       132.       124.
                 116.       109.       103.        97.        91.        86.        81.        77.        72.        68.
                  65.        61.        58.        55.        52.        49.        47.        46.        44.        43.

                                                    STORAGE
                   0.         0.         0.         0.         0.         0.         0.         0.         0.         0.
                   0.         0.         0.         0.         0.         0.         0.         0.         0.         0.
                   0.         0.         0.         0.         0.         0.         0.         0.         0.         0.
                   0.         0.         0.         0.         1.         1.         1.         2.         2.         2.
                   2.         2.         2.         2.         2.         2.         2.         2.         2.         2.
                   2.         2.         2.         2.         2.         2.         2.         2.         2.         2.
                   2.         2.         2.         2.         3.         3.         4.         4.         5.         6.
                   6.         7.         8.         9.        10.        13.        17.        22.        28.        36.
                  46.        58.        71.        85.        97.       106.       113.       116.       116.       115.
                 111.       107.       102.        97.        92.        87.        83.        78.        74.        71.
                  68.        65.        62.        59.        56.        54.        52.        50.        48.        46.
                  45.        43.        42.        40.        39.        38.        37.        36.        35.        34.

                                                     STAGE
              1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0
              1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0
              1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0
              1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0
              1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0     1558.0
```

1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.1	1558.1	1558.1	
1558.1	1558.1	1558.1	1558.1	1558.1	1558.2	1558.2	1558.3	1558.4	1558.5	
1558.6	1558.8	1558.9	1559.1	1559.3	1559.4	1559.5	1559.5	1559.5	1559.5	
1559.4	1559.4	1559.3	1559.3	1559.2	1559.1	1559.1	1559.0	1559.0	1558.9	
1558.9	1558.9	1558.8	1558.8	1558.7	1558.7	1558.7	1558.7	1558.6	1558.6	
1558.6	1558.6	1558.6	1558.5	1558.5	1558.5	1558.5	1558.5	1558.5	1558.5	

PEAK OUTFLOW IS 249. AT TIME 44.50 HOURS

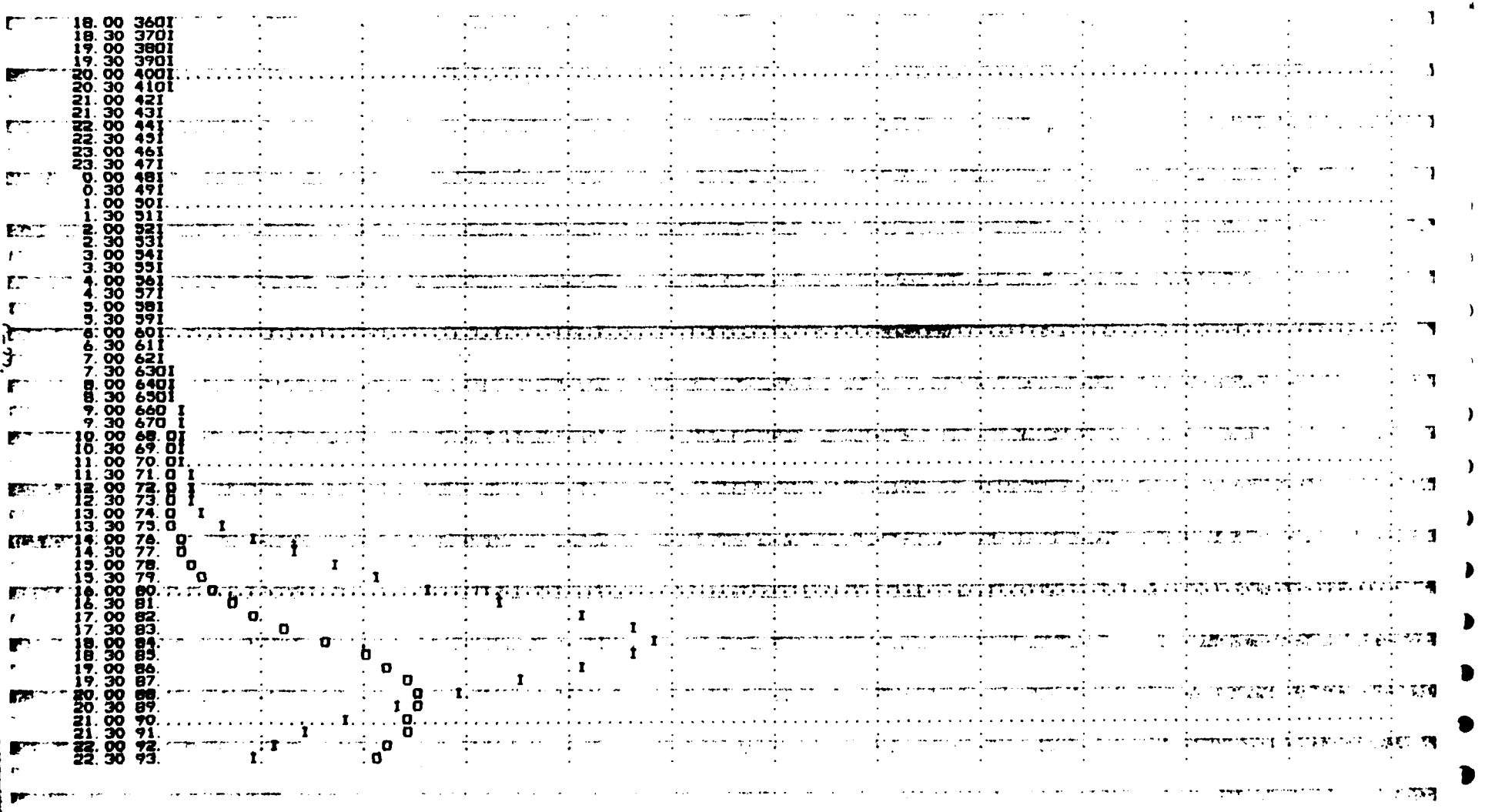
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	249.	217.	108.	44.	5315.
CMS	7.	6.	3.	1.	151.
INCHES		0.91	1.81	1.85	1.85
MM		23.03	45.88	46.93	46.93
AC-FT		108.	215.	220.	220.
THOUS CU M		133.	265.	271.	271.

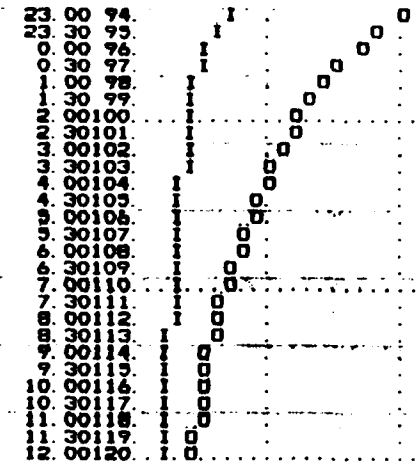
OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0.	100.	200.	300.	400.	500.	0.	0.	0.	0.	0.	0.	0.
0.30	11												
1.00	21												
1.30	31												
2.00	41												
2.30	51												
3.00	61												
3.30	71												
4.00	81												
4.30	91												
5.00	101												
5.30	111												
6.00	121												
6.30	131												
7.00	141												
7.30	151												
8.00	161												
8.30	171												
9.00	181												
9.30	191												
10.00	201												
10.30	211												
11.00	221												
11.30	231												
12.00	241												
12.30	251												
13.00	261												
13.30	271												
14.00	281												
14.30	291												
15.00	301												
15.30	311												
16.00	321												
16.30	331												
17.00	3401												
17.30	3501												


18.00 360I
18.30 370I
19.00 380I
19.30 390I
20.00 400I
20.30 410I
21.00 42I
21.30 43I
22.00 44I
22.30 45I
23.00 46I
23.30 47I
0.00 48I
0.30 49I
1.00 50I
1.30 51I
2.00 52I
2.30 53I
3.00 54I
3.30 55I
4.00 56I
4.30 57I
5.00 58I
5.30 59I
6.00 60I
6.30 61I
7.00 62I
7.30 630I
8.00 640I
8.30 650I
9.00 660 I
9.30 670 I
10.00 68.0I
10.30 69.0I
11.00 70.0I
11.30 71.0 I
12.00 72.0 I
12.30 73.0 I
13.00 74.0 I
13.30 75.0 I
14.00 76. 0 I
14.30 77. 0 I
15.00 78. 0 I
15.30 79. 0 I
16.00 80. 0 I
16.30 81. 0 I
17.00 82. 0 I
17.30 83. 0 I
18.00 84. 0 I
18.30 85. 0 I
19.00 86. 0 I
19.30 87. 0 I
20.00 88. 0 I
20.30 89. I 0
21.00 90. I 0
21.30 91. I 0
22.00 92. I 0
22.30 93. I 0



#OVN#

STATION I, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	2.	3.	3.	4.	4.
5.	5.	5.	5.	5.	5.	5.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	5.	6.	7.	8.	10.	11.
18.	14.	19.	17.	20.	25.	32.	42.	59.	85.
117.	161.	215.	272.	326.	368.	395.	407.	405.	392.
372.	348.	323.	298.	274.	250.	230.	212.	196.	181.
168.	155.	144.	134.	127.	120.	114.	108.	102.	97.
91.	87.	82.	78.	74.	70.	67.	84.	80.	98.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	1.	1.	2.	3.	3.	3.
4.	4.	4.	4.	4.	4.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	4.	5.	5.	6.	7.	8.

10.	11.	12.	13.	16.	19.	25.	33.	42.	54.
68.	85.	104.	123.	140.	153.	161.	164.	163.	160.
154.	147.	139.	132.	124.	116.	109.	103.	97.	92.
87.	83.	79.	76.	72.	69.	66.	64.	61.	59.
57.	54.	53.	51.	49.	47.	46.	44.	43.	42.

STAGE

1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.1	1558.1	1558.1	1558.1	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1
1558.1	1558.1	1558.2	1558.2	1558.2	1558.3	1558.3	1558.4	1558.6	1558.7
1558.9	1559.1	1559.4	1559.6	1559.8	1560.0	1560.0	1560.1	1560.1	1560.0
1560.0	1559.9	1559.8	1559.7	1559.6	1559.5	1559.4	1559.3	1559.3	1559.2
1559.1	1559.1	1559.0	1559.0	1559.0	1558.9	1558.9	1558.8	1558.8	1558.8
1558.8	1558.7	1558.7	1558.7	1558.7	1558.6	1558.6	1558.6	1558.6	1558.6

PEAK OUTFLOW IS 407. AT TIME 44.00 HOURS

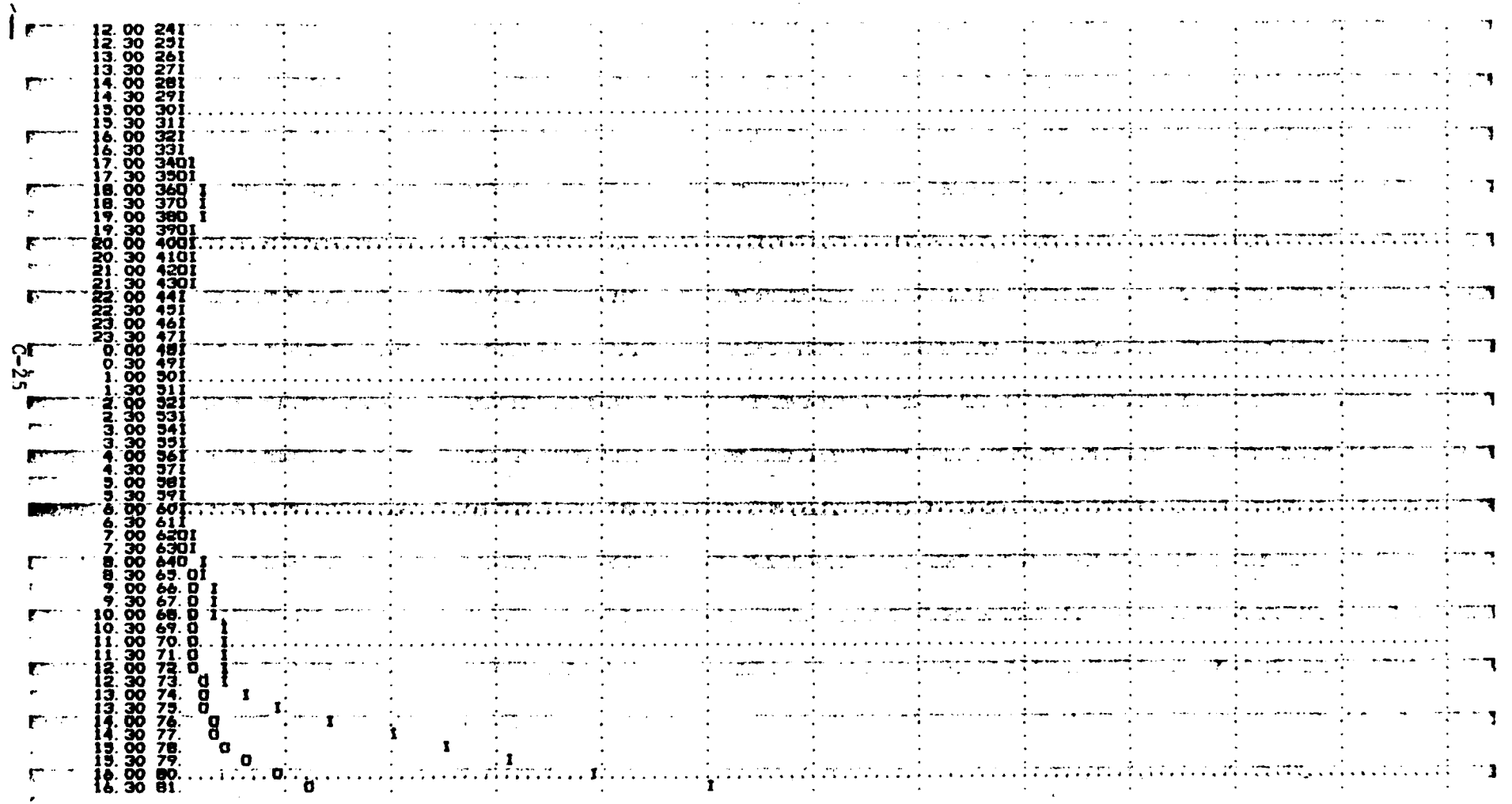
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	407.	347.	167.	68.	8202.
CMS	12.	10.	5.	2.	232.
INCHES		1.45	2.79	2.85	2.85
MM		36.81	70.78	72.42	72.42
AC-FT		172.	331.	339.	339.
THOUS CU M		213.	409.	418.	418.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0.	100.	200.	300.	400.	500.	600.	700.	800.	0.	0.	0.	0.
0.30	11												
1.00	21												
1.30	31												
2.00	41												
2.30	51												
3.00	61												
3.30	71												
4.00	81												
4.30	91												
5.00	101												
5.30	111												
6.00	121												
6.30	131												
7.00	141												
7.30	151												
8.00	161												
8.30	171												
9.00	181												
9.30	191												
10.00	201												
10.30	211												
11.00	221												
11.30	231												


12.00 241
12.30 251
13.00 261
13.30 271
14.00 281
14.30 291
15.00 301
15.30 311
16.00 321
16.30 331
17.00 3401
17.30 3501
18.00 360
18.30 370
19.00 380
19.30 3901
20.00 4001
20.30 4101
21.00 4201
21.30 4301
22.00 441
22.30 451
23.00 461
23.30 471
0.00 481
0.30 491
1.00 501
1.30 511
2.00 521
2.30 531
3.00 541
3.30 551
4.00 561
4.30 571
5.00 581
5.30 591
6.00 601
6.30 611
7.00 6201
7.30 6301
8.00 640
8.30 65.01
9.00 66.01
9.30 67.01
10.00 68.01
10.30 69.01
11.00 70.01
11.30 71.01
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12.30 73.01
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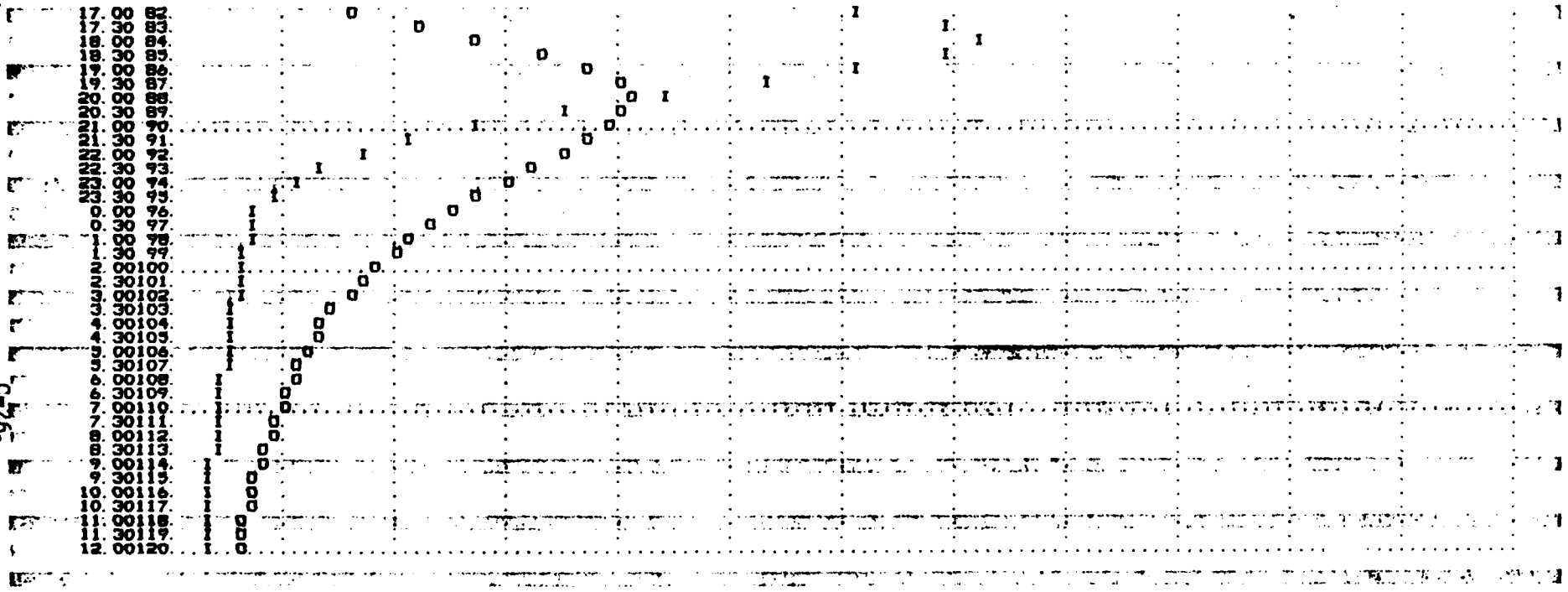
16.30 81.01



DVN

STATION "1" PLAN 1, RATIO 3

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	1.	1.	2.	3.	4.	5.	5.
	5.	5.	5.	5.	5.	5.	5.	5.	5.	4.
	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
	4.	4.	4.	3.	3.	6.	8.	9.	10.	12.
	13.	15.	16.	18.	22.	27.	35.	45.	66.	93.
	127.	176.	233.	296.	354.	400.	428.	440.	437.	422.

400.	374.	346.	318.	292.	266.	243.	225.	208.	192.
178.	165.	153.	142.	133.	126.	119.	113.	107.	102.
96.	91.	87.	82.	78.	74.	71.	67.	64.	61.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	2.	2.	3.	3.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	4.	4.	5.	6.	7.	8.	9.
10.	11.	13.	14.	17.	21.	27.	35.	45.	57.
72.	90.	111.	131.	149.	162.	170.	173.	172.	168.
162.	154.	146.	138.	130.	122.	114.	108.	101.	96.
91.	86.	82.	79.	75.	72.	69.	66.	63.	61.
59.	57.	54.	53.	51.	49.	47.	46.	44.	43.

STAGE

1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1
1558.1	1558.2	1558.2	1558.2	1558.2	1558.3	1558.4	1558.5	1558.6	1558.8
1559.0	1559.2	1559.4	1559.7	1559.9	1560.1	1560.2	1560.2	1560.2	1560.1
1560.1	1560.0	1559.9	1559.8	1559.7	1559.6	1559.5	1559.4	1559.3	1559.2
1559.2	1559.1	1559.1	1559.0	1559.0	1558.9	1558.9	1558.9	1558.8	1558.8
1558.8	1558.8	1558.7	1558.7	1558.7	1558.7	1558.6	1558.6	1558.6	1558.6

PEAK OUTFLOW IS 440. AT TIME 44.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	440.	374.	179.	73.	8784.
CMS	12.	11.	5.	2.	249.
INCHES		1.56	2.98	3.05	3.05
MM		39.65	75.80	77.56	77.56
AC-FT		186.	355.	363.	363.
THOUS CU M		229.	438.	448.	448.

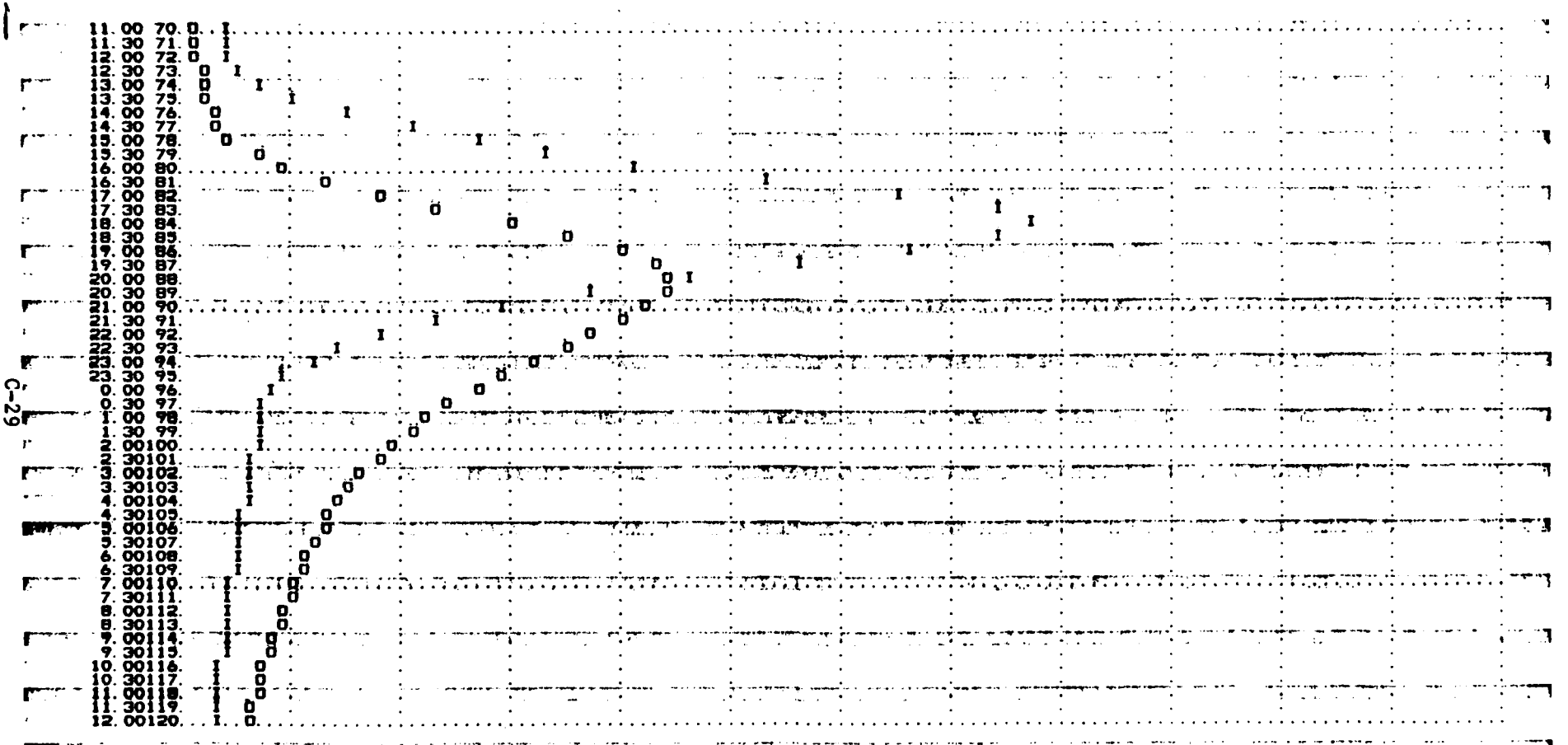
#OVF#

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

		0.	100.	200.	300.	400.	500.	600.	700.	800.	0.	0.	0.	0.
0.30	11													
1.00	21													
1.30	31													
2.00	41													
2.30	51													
3.00	61													
3.30	71													
4.00	81													
4.30	91													
5.00	101													
5.30	111													

6.00 12I
6.30 13I
7.00 14I
7.30 15I
8.00 16I
8.30 17I
9.00 18I
9.30 19I
10.00 20I
10.30 21I
11.00 22I
11.30 23I
12.00 24I
12.30 25I
13.00 26I
13.30 27I
14.00 28I
14.30 29I
15.00 30I
15.30 31I
16.00 32I
16.30 33I
17.00 340I
17.30 350I
18.00 360 I
18.30 370 I
19.00 380 I
19.30 390I
20.00 400I
20.30 410I
21.00 42. I
21.30 43. I
22.00 4410
22.30 4510
23.00 4610
23.30 471
0.00 481
0.30 491
1.00 501
1.30 511
2.00 521
2.30 531
3.00 541
3.30 551
4.00 561
4.30 571
5.00 581
5.30 591
6.00 601
6.30 611
7.00 6201
7.30 6301
8.00 640 I
8.30 65.0I
9.00 66.0 I
9.30 67.0 I
10.00 68.0 I
10.30 69.0 I



OVN

STATION 1, PLAN 1, RATIO 4

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	2.	3.	4.	4.	5.
5.	5.	6.	6.	5.	5.	5.	5.	5.	5.
5.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	5.	6.	7.	8.	10.	11.	13.
14.	16.	17.	19.	23.	29.	37.	48.	72.	101.
137.	191.	252.	320.	383.	431.	462.	475.	470.	452.
427.	399.	368.	338.	310.	283.	258.	237.	219.	203.
188.	174.	162.	151.	140.	132.	125.	118.	112.	106.
101.	96.	91.	86.	82.	78.	74.	71.	67.	64.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	2.	2.	3.	3.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	4.	4.	5.	6.	7.	9.	10.
11.	12.	13.	15.	18.	22.	29.	37.	48.	61.
77.	96.	117.	138.	157.	171.	179.	182.	181.	176.
170.	162.	153.	144.	135.	127.	119.	112.	105.	100.
94.	90.	85.	81.	78.	74.	71.	68.	66.	63.
61.	59.	56.	54.	52.	51.	49.	47.	46.	44.

STAGE

1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.1
1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1
1558.1	1558.2	1558.2	1558.2	1558.2	1558.3	1558.4	1558.5	1558.6	1558.8
1559.0	1559.2	1559.5	1559.8	1560.0	1560.2	1560.3	1560.3	1560.3	1560.2
1560.2	1560.1	1560.0	1559.8	1559.7	1559.6	1559.5	1559.5	1559.4	1559.3
1559.2	1559.2	1559.1	1559.1	1559.0	1559.0	1558.9	1558.9	1558.9	1558.8
1558.8	1558.8	1558.7	1558.7	1558.7	1558.7	1558.7	1558.6	1558.6	1558.6

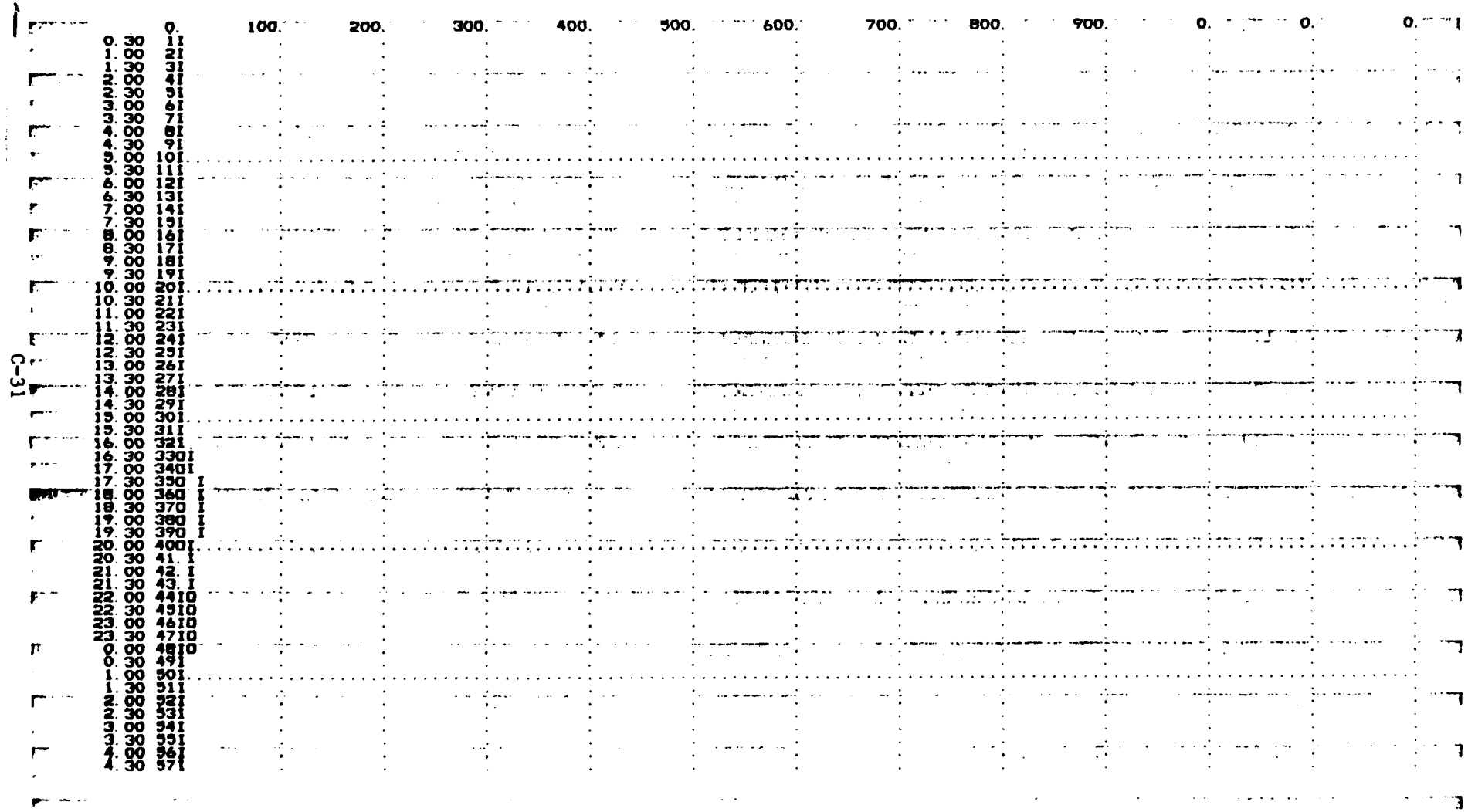
PEAK OUTFLOW IS 475. AT TIME 44.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	475.	401.	191.	78.	9368.
CMS	13.	11.	5.	2.	265.
INCHES		1.67	3.18	3.25	3.25
MM		42.53	80.83	82.71	82.71
AC-FT		199.	378.	387.	387.
THOUS CU M		246.	467.	477.	477.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(#)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2.00 41
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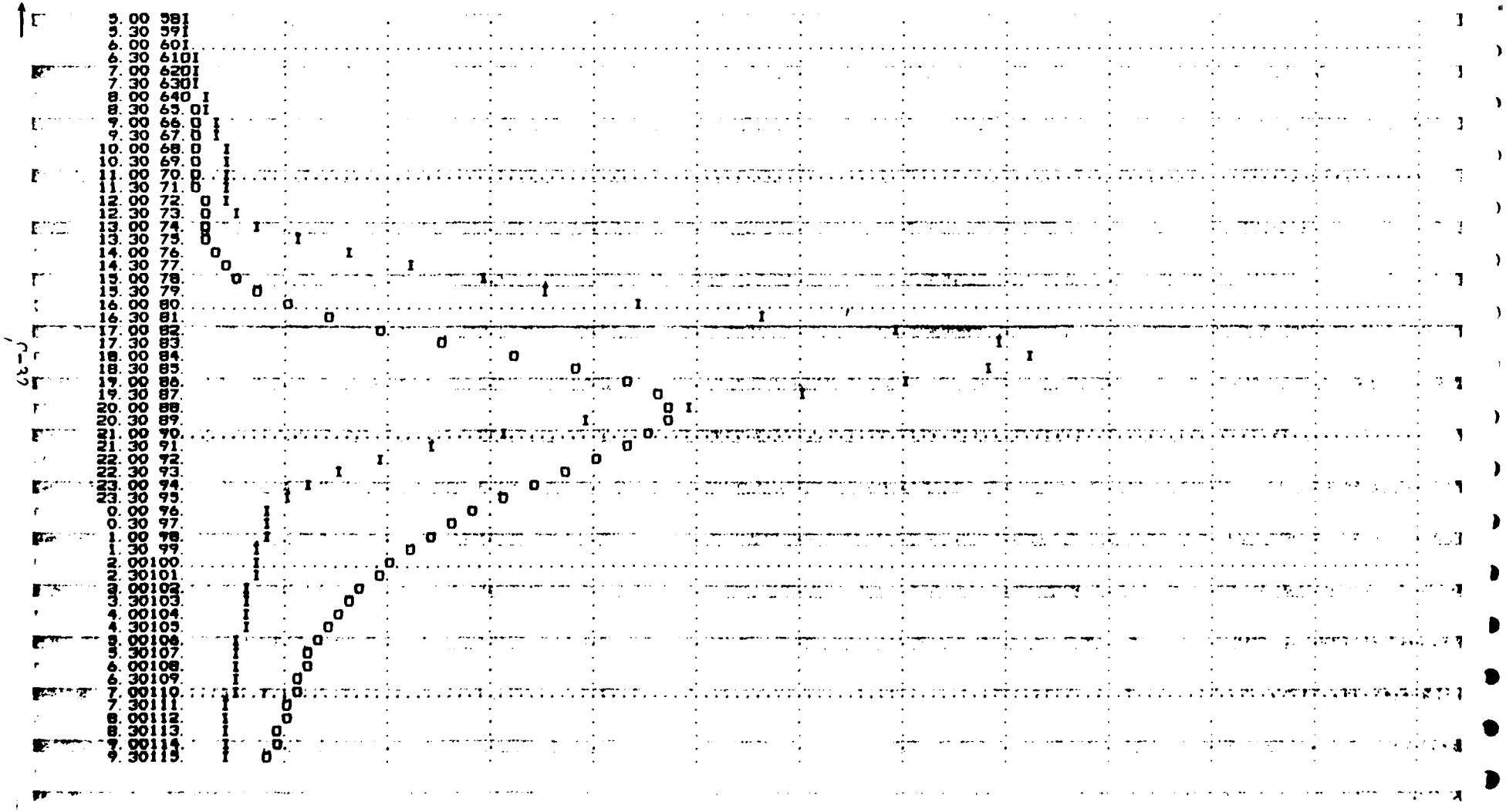
3.00 61
3.30 71
4.00 81
4.30 91
5.00 101
5.30 111
6.00 121
6.30 131
7.00 141
7.30 151
8.00 161
8.30 171
9.00 181
9.30 191
10.00 201
10.30 211
11.00 221
11.30 231
12.00 241
12.30 251
13.00 261
13.30 271
14.00 281
14.30 291
15.00 301
15.30 311
16.00 321
16.30 331
17.00 341
17.30 351
18.00 361
18.30 371
19.00 381
19.30 391
20.00 401
20.30 41.
21.00 42.
21.30 43.
22.00 4410
22.30 4510
23.00 4610
23.30 4710
0.00 4810
0.30 491
1.00 501
1.30 511
2.00 521
2.30 531
3.00 541
3.30 551
4.00 561
4.30 571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6.00 601
6.30 6101
7.00 6201
7.30 6301
8.00 640 I
8.30 65. 01
9.00 66. 0 I
9.30 67. 0 I
10.00 68. 0 I
10.30 69. 0 I
11.00 70. 0 I
11.30 71. 0 I
12.00 72. 0 I
12.30 73. 0 I
13.00 74. 0 I
13.30 75. 0 I
14.00 76. 0 I
14.30 77. 0 I
15.00 78. 0 I
15.30 79. 0 I
16.00 80. 0 I
16.30 81. 0 I
17.00 82. 0 I
17.30 83. 0 I
18.00 84. 0 I
18.30 85. 0 I
19.00 86. 0 I
19.30 87. 0 I
20.00 88. 0 I
20.30 89. 0 I
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21.30 91. 0 I
22.00 92. 0 I
22.30 93. 0 I
23.00 94. 0 I
23.30 95. 0 I
0.00 96. 0 I
0.30 97. 0 I
1.00 98. 0 I
1.30 99. 0 I
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5.30107. 0 I
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7.30111. 0 I
8.00112. 0 I
8.30113. 0 I
9.00114. 0 I
9.30115. 0 I

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10.30117.    I    O
11.00118.    I    O
11.30119.    I    O
12.00120.    I    O
```

#OVN#

STATION 1, PLAN 1, RATIO 5

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	2.	3.	4.	5.	5.
6.	6.	6.	6.	6.	6.	5.	5.	5.	5.
5.	5.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	5.	5.	6.	7.	9.	10.	12.	13.
15.	16.	18.	21.	24.	30.	39.	53.	78.	109.
149.	206.	272.	344.	411.	464.	498.	510.	504.	483.
454.	423.	390.	358.	326.	298.	272.	248.	230.	213.
197.	183.	170.	158.	147.	138.	130.	123.	117.	111.
105.	100.	95.	90.	86.	82.	78.	74.	71.	67.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	2.	2.	3.	4.	4.
4.	4.	5.	5.	4.	4.	4.	4.	4.	4.
4.	4.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	4.	4.	5.	6.	7.	8.	9.	10.
12.	13.	14.	16.	19.	23.	30.	40.	51.	64.
81.	101.	123.	146.	165.	179.	188.	191.	189.	184.
177.	168.	159.	150.	140.	132.	123.	116.	109.	103.
98.	93.	88.	84.	80.	77.	74.	71.	68.	65.
63.	60.	58.	56.	54.	52.	51.	49.	47.	46.

STAGE

1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.1	1558.1
1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1
1558.2	1558.2	1558.2	1558.2	1558.3	1558.3	1558.4	1558.5	1558.7	1558.8
1559.1	1559.3	1559.6	1559.9	1560.1	1560.3	1560.4	1560.4	1560.4	1560.3
1560.2	1560.1	1560.0	1559.9	1559.8	1559.7	1559.6	1559.5	1559.4	1559.3
1559.3	1559.2	1559.2	1559.1	1559.1	1559.0	1559.0	1558.9	1558.9	1558.9
1558.8	1558.8	1558.8	1558.7	1558.7	1558.7	1558.7	1558.7	1558.6	1558.6

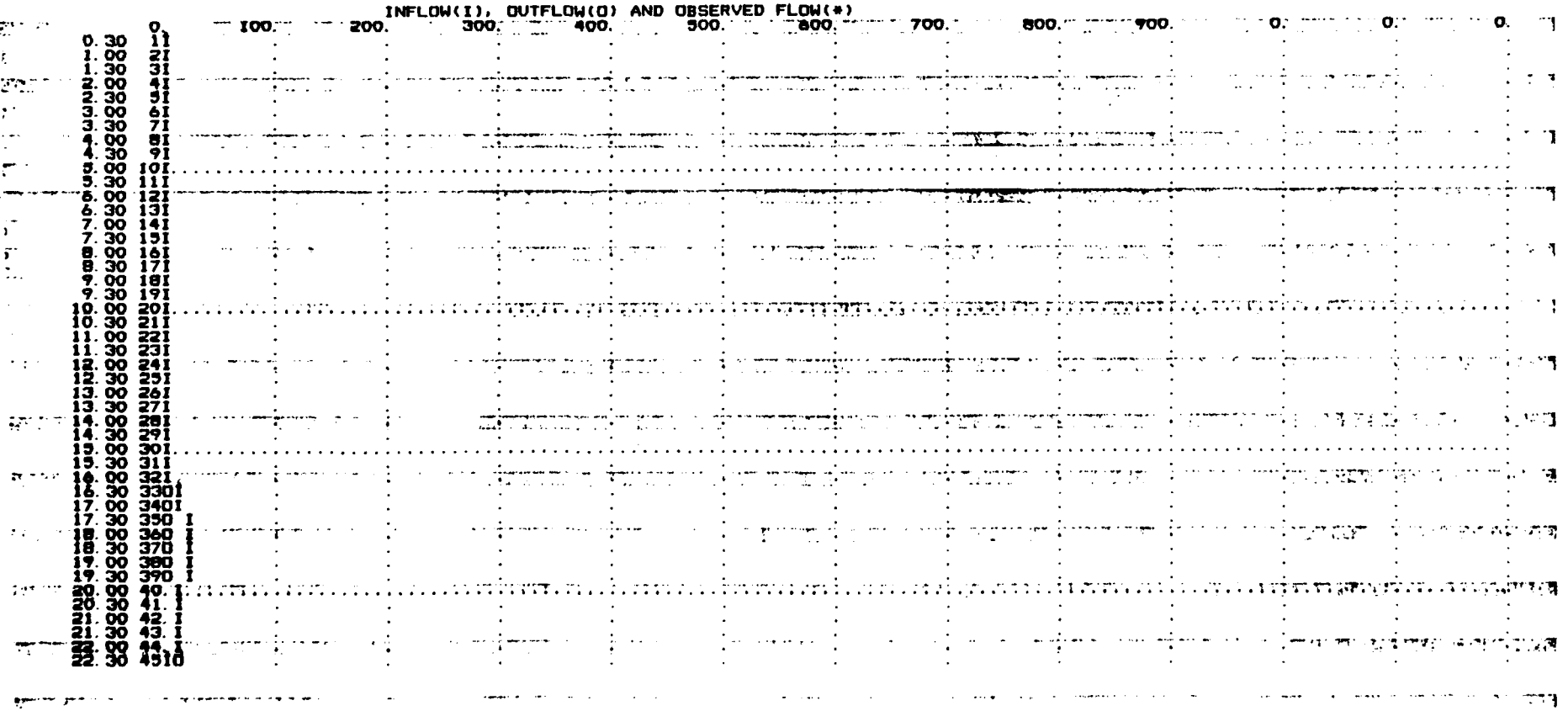
PEAK OUTFLOW IS 510. AT TIME 44.00 HOURS

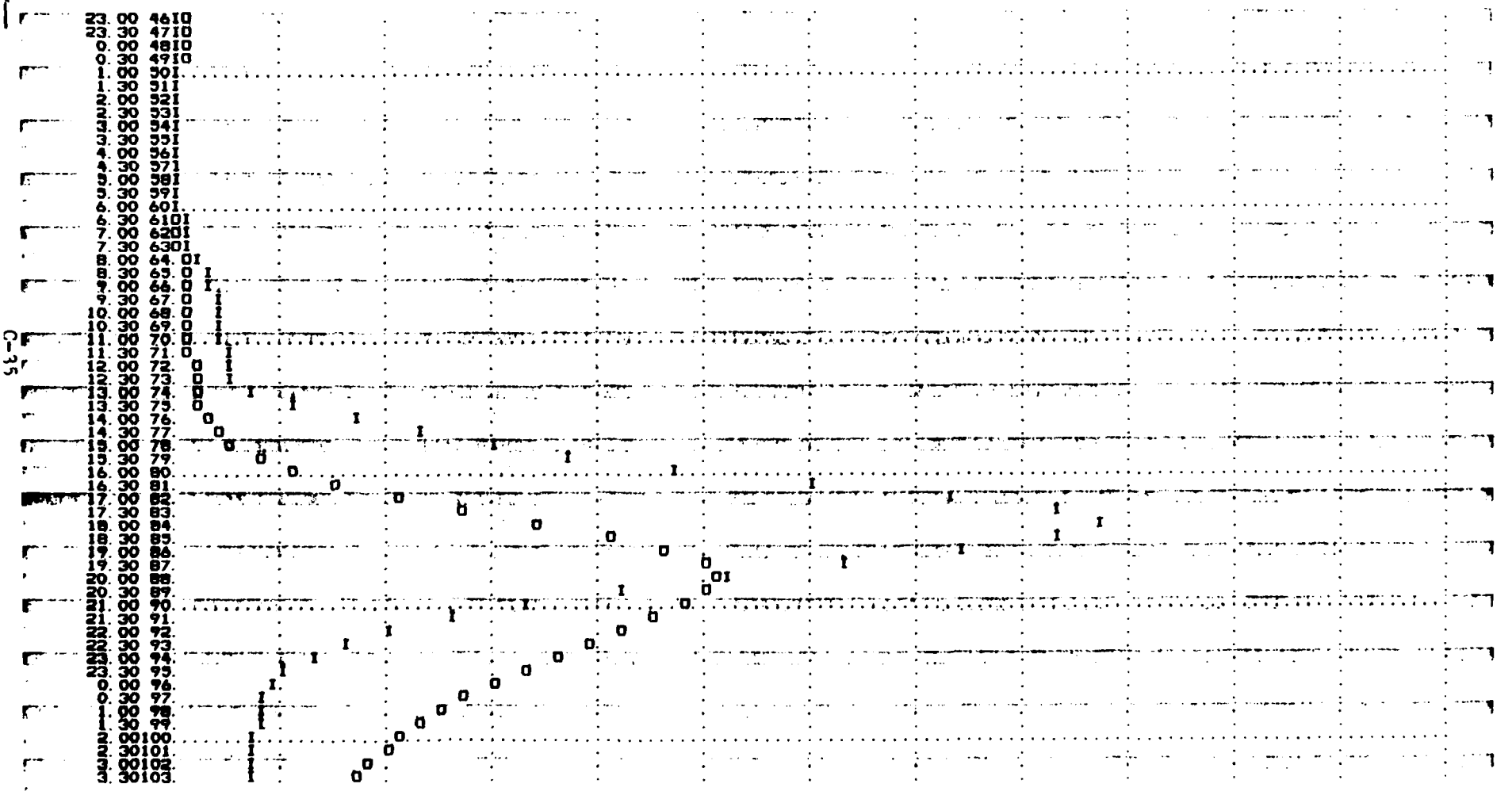
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	510.	429.	203.	83.	9948.
CMS	14.	12.	6.	2.	282.
INCHES		1.79	3.38	3.46	3.46
MM		45.41	85.85	87.84	87.84
AC-FT		213.	402.	411.	411.
THOUS CU M		262.	496.	507.	507.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

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0.00 48I0
0.30 49I0
1.00 50I
1.30 51I
2.00 52I
2.30 53I
3.00 54I
3.30 55I
4.00 56I
4.30 57I
5.00 58I
5.30 59I
6.00 60I
6.30 61I0I
7.00 62I0I
7.30 63I0I
8.00 64.0I
8.30 65.0 I
9.00 66.0 I
9.30 67.0 I
10.00 68.0 I
10.30 69.0 I
11.00 70.0 I
11.30 71.0 I
12.00 72. 0 I
12.30 73. 0 I
13.00 74. 0 I
13.30 75. 0 I
14.00 76. 0 I
14.30 77. 0 I
15.00 78. 0 I
15.30 79. 0 I
16.00 80. 0 I
16.30 81. 0 I
17.00 82. 0 I
17.30 83. 0 I
18.00 84. 0 I
18.30 85. 0 I
19.00 86. 0 I
19.30 87. 0 I
20.00 88. 0I
20.30 89. 0 I
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21.30 91. 0 I
22.00 92. 0 I
22.30 93. 0 I
23.00 94. 0 I
23.30 95. 0 I
0.00 96. 0 I
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3.00102. 0 I
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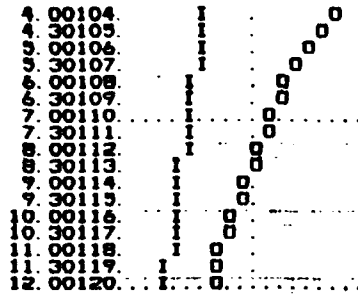


OVN

STATION 1, PLAN 1, RATIO 6

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	2.	2.	3.	4.	5.	6.
6.	6.	6.	6.	6.	6.	6.	6.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	6.	6.	8.	9.	11.	12.	14.
16.	17.	19.	22.	26.	32.	41.	58.	85.	116.
161.	221.	292.	369.	440.	499.	534.	545.	537.	515.
483.	447.	412.	377.	344.	313.	289.	261.	240.	222.
206.	191.	178.	166.	154.	144.	135.	128.	121.	115.
110.	104.	99.	94.	90.	85.	81.	77.	74.	70.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	2.	3.	3.	4.	4.
5.	5.	5.	5.	5.	5.	5.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	5.	6.	7.	8.	9.	11.
12.	13.	15.	17.	20.	25.	32.	42.	53.	68.
85.	106.	130.	153.	173.	188.	197.	199.	198.	192.
184.	175.	165.	155.	146.	136.	128.	120.	113.	107.
101.	96.	91.	87.	83.	79.	76.	73.	70.	67.
65.	62.	60.	58.	56.	54.	52.	50.	49.	47.

STAGE

1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0

1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.1	1558.1
1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1
1558.1	1558.1	1558.1	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1
1558.2	1558.2	1558.2	1558.2	1558.3	1558.3	1558.4	1558.6	1558.7	1558.9
1559.1	1559.4	1559.7	1560.0	1560.2	1560.4	1560.5	1560.5	1560.5	1560.4
1560.3	1560.2	1560.1	1560.0	1559.9	1559.7	1559.6	1559.5	1559.5	1559.4
1559.3	1559.2	1559.2	1559.1	1559.1	1559.0	1559.0	1559.0	1558.9	1558.9
1558.9	1558.8	1558.8	1558.8	1558.7	1558.7	1558.7	1558.7	1558.6	1558.5

PEAK OUTFLOW IS 545. AT TIME 44.00 HOURS

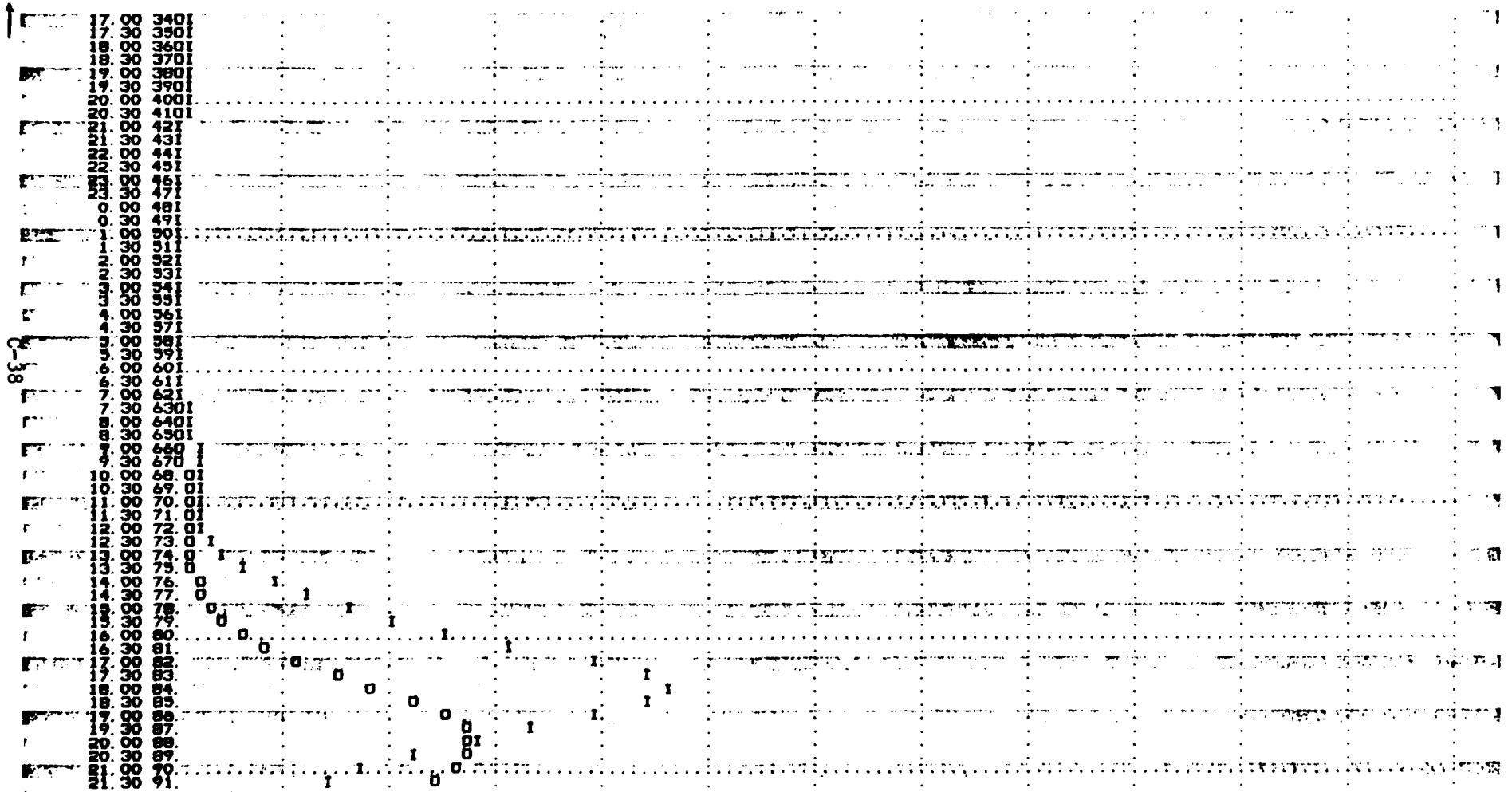
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	545.	456.	214.	88.	10531.
CMS	15.	13.	6.	2.	298.
INCHES		1.90	3.58	3.66	3.66
MM		48.34	90.87	92.98	92.98
AC-FT		226.	425.	435.	439.
THOUS CU M		279.	525.	537.	537.

DVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0.	200.	400.	600.	800.	1000.	0.	0.	0.	0.	0.	0.	0.
0.30	11												
1.00	21												
1.30	31												
2.00	41												
2.30	51												
3.00	61												
3.30	71												
4.00	81												
4.30	91												
5.00	101												
5.30	111												
6.00	121												
6.30	131												
7.00	141												
7.30	151												
8.00	161												
8.30	171												
9.00	181												
9.30	191												
10.00	201												
10.30	211												
11.00	221												
11.30	231												
12.00	241												
12.30	251												
13.00	261												
13.30	271												
14.00	281												
14.30	291												
15.00	301												
15.30	311												
16.00	321												
16.30	331												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18.30 370
19.00 380
19.30 390
20.00 400
20.30 410
21.00 420
21.30 430
22.00 440
22.30 450
23.00 460
23.30 470
0.00 480
0.30 490
1.00 500
1.30 510
2.00 520
2.30 530
3.00 540
3.30 550
4.00 560
4.30 570
5.00 580
5.30 590
6.00 600
6.30 610
7.00 620
7.30 630
8.00 640
8.30 650
9.00 660
9.30 670
10.00 68.0
10.30 69.0
11.00 70.0
11.30 71.0
12.00 72.0
12.30 73.0
13.00 74.0
13.30 75.0
14.00 76.0
14.30 77.0
15.00 78.0
15.30 79.0
16.00 80.0
16.30 81.0
17.00 82.0
17.30 83.0
18.00 84.0
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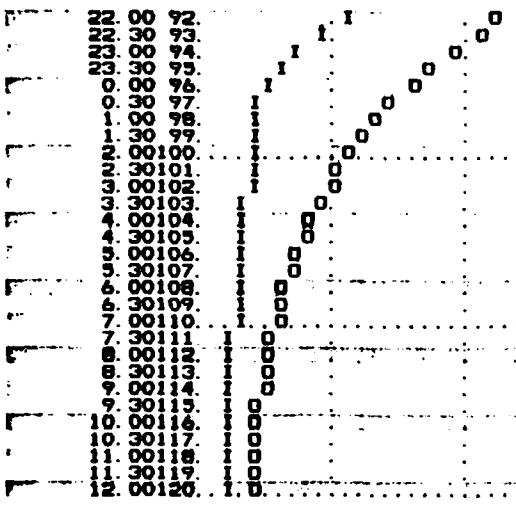
20.30 89.0
21.00 90.0
21.30 91.0



#OVN#

STATION 1, PLAN 1, RATIO 7

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	2.	3.	4.	5.	5.	6.
6.	6.	7.	7.	6.	6.	6.	6.	6.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	6.	7.	8.	10.	11.	13.	15.
17.	18.	20.	23.	27.	33.	43.	63.	91.	124.
173.	235.	312.	394.	472.	534.	571.	583.	572.	546.
511.	472.	432.	395.	360.	327.	298.	273.	250.	231.
219.	200.	186.	173.	161.	151.	141.	133.	126.	120.
114.	108.	103.	98.	93.	89.	85.	81.	77.	73.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	2.	3.	4.	4.	5.
5.	5.	5.	5.	5.	5.	5.	5.	4.	4.

4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	5.	5.	6.	7.	9.	10.	11.
13.	14.	16.	18.	21.	26.	34.	44.	56.	71.
89.	111.	136.	160.	181.	197.	205.	208.	206.	199.
191.	181.	171.	161.	150.	141.	132.	124.	116.	110.
104.	99.	94.	89.	85.	81.	78.	75.	72.	69.
67.	64.	62.	60.	57.	55.	54.	52.	50.	49.

STAGE

1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.1	1558.1
1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1
1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1
1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.2
1558.2	1558.2	1558.2	1558.2	1558.3	1558.4	1558.5	1558.6	1558.7	1558.7
1559.2	1559.4	1559.7	1560.0	1560.3	1560.5	1560.6	1560.6	1560.6	1560.5
1560.4	1560.3	1560.2	1560.0	1559.9	1559.8	1559.7	1559.6	1559.5	1559.4
1559.4	1559.3	1559.2	1559.2	1559.1	1559.1	1559.0	1559.0	1558.9	1558.9
1558.9	1558.8	1558.8	1558.8	1558.8	1558.7	1558.7	1558.7	1558.7	1558.6

PEAK OUTFLOW IS 583. AT TIME 44.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	583.	485.	226.	93.	11116.
CMS	17.	14.	6.	3.	315.
INCHES		2.02	3.78	3.86	3.86
MM		51.37	95.93	98.15	98.15
AC-FT		240.	449.	459.	459.
THOUS CU M		297.	554.	567.	567.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0.	200.	400.	600.	800.	1000.	0.	0.	0.	0.	0.	0.	0.
0.30	11												
1.00	21												
1.30	31												
2.00	41												
2.30	51												
3.00	61												
3.30	71												
4.00	81												
4.30	91												
5.00	101												
5.30	111												
6.00	121												
6.30	131												
7.00	141												
7.30	151												
8.00	161												
8.30	171												
9.00	181												
9.30	191												
10.00	201												
10.30	211												

```
11.00 221I
11.30 231I
12.00 241I
12.30 251I
13.00 261I
13.30 271I
14.00 281I
14.30 291I
15.00 301I
15.30 311I
16.00 321I
16.30 331I
17.00 340I
17.30 350I
18.00 360I
18.30 370I
19.00 380I
19.30 390I
20.00 400I
20.30 410I
21.00 421I
21.30 431I
22.00 441I
22.30 451I
23.00 461I
23.30 471I
 0.00 481I
 0.30 491I
 1.00 501I
 1.30 511I
 2.00 521I
 2.30 531I
 3.00 541I
 3.30 551I
 4.00 561I
 4.30 571I
 5.00 581I
 5.30 591I
 6.00 601I
 6.30 611I
 7.00 621I
 7.30 630I
 8.00 640I
 8.30 650I
 9.00 660 I
 9.30 670 I
10.00 68. 0I
10.30 69. 0I
11.00 70. 0I
11.30 71. 0 I
12.00 72. 0 I
12.30 73. 0 I
13.00 74. 0  I
13.30 75.  0   I
14.00 76.   0    I
14.30 77.    0     I
15.00 78.     0      I
15.30 79.      0       I
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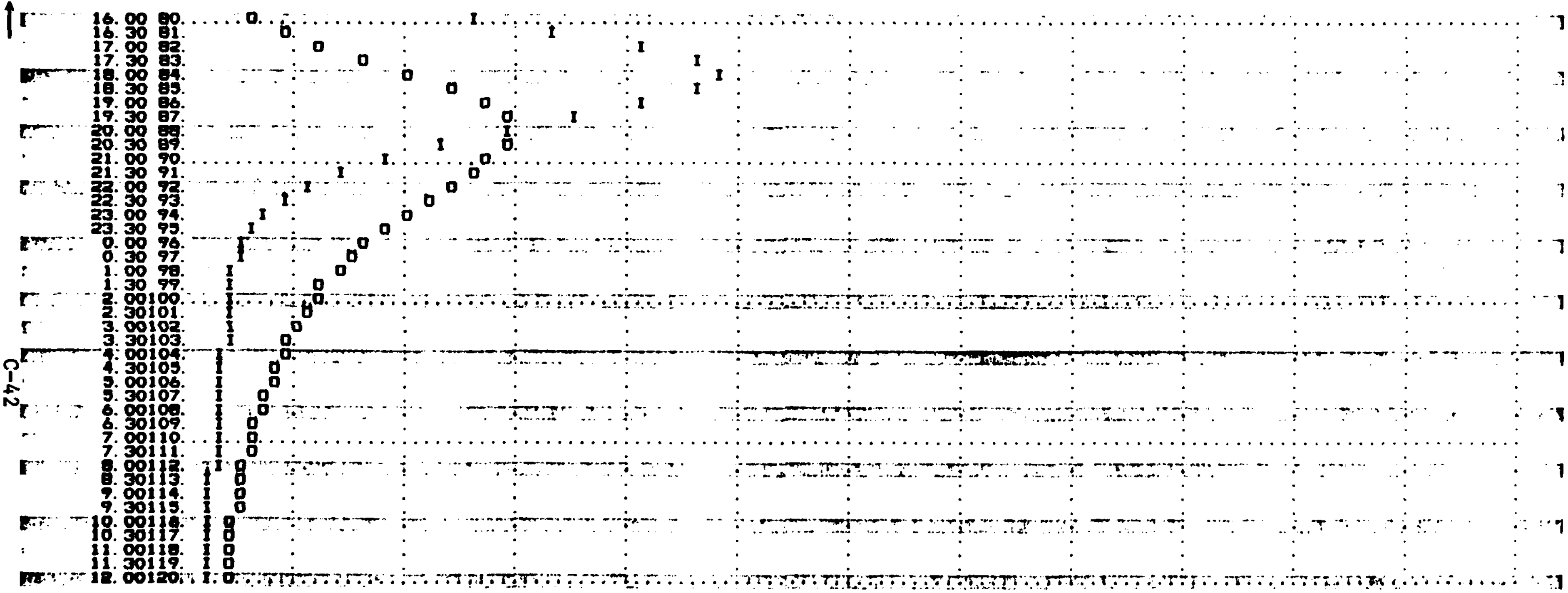


STATION 1, PLAN 1, RATIO 6

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	3.	4.	7.	9.	12.	14.	15.
16.	17.	17.	17.	16.	16.	16.	15.	15.	14.
14.	13.	13.	13.	13.	12.	12.	12.	12.	12.
12.	13.	14.	15.	17.	20.	24.	28.	33.	37.

41.	46.	53.	64.	81.	109.	152.	218.	303.	416.
578.	826.	1181.	1495.	1725.	1845.	1860.	1792.	1662.	1494.
1313.	1135.	969.	820.	706.	630.	563.	509.	465.	428.
397.	369.	345.	324.	305.	288.	271.	257.	243.	232.
221.	211.	201.	192.	183.	175.	167.	160.	153.	146.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	2.	3.	5.	7.	9.	11.	12.
12.	13.	13.	13.	13.	12.	12.	12.	11.	11.
11.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	12.	13.	16.	19.	22.	25.	29.
32.	36.	40.	44.	52.	64.	82.	105.	133.	166.
207.	254.	302.	345.	376.	392.	394.	384.	367.	344.
320.	296.	273.	253.	235.	218.	203.	191.	180.	170.
161.	153.	146.	140.	134.	128.	123.	118.	114.	110.
106.	103.	99.	96.	93.	90.	87.	85.	82.	80.

STAGE

1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.1	1558.1	1558.1	1558.1	1558.2
1558.2	1558.2	1558.2	1558.2	1558.2	1558.2	1558.2	1558.2	1558.2	1558.1
1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1	1558.1
1558.1	1558.1	1558.1	1558.2	1558.2	1558.2	1558.3	1558.3	1558.3	1558.4
1558.5	1558.5	1558.5	1558.6	1558.7	1558.8	1559.1	1559.4	1559.7	1560.1
1560.6	1561.1	1561.7	1562.2	1562.5	1562.7	1562.7	1562.6	1562.4	1562.2
1561.9	1561.6	1561.4	1561.1	1560.9	1560.7	1560.6	1560.4	1560.3	1560.2
1560.0	1560.0	1559.9	1559.8	1559.7	1559.7	1559.6	1559.5	1559.5	1559.4
1559.4	1559.3	1559.3	1559.3	1559.2	1559.2	1559.1	1559.1	1559.1	1559.0

PEAK OUTFLOW IS 1860. AT TIME 43.50 HOURS

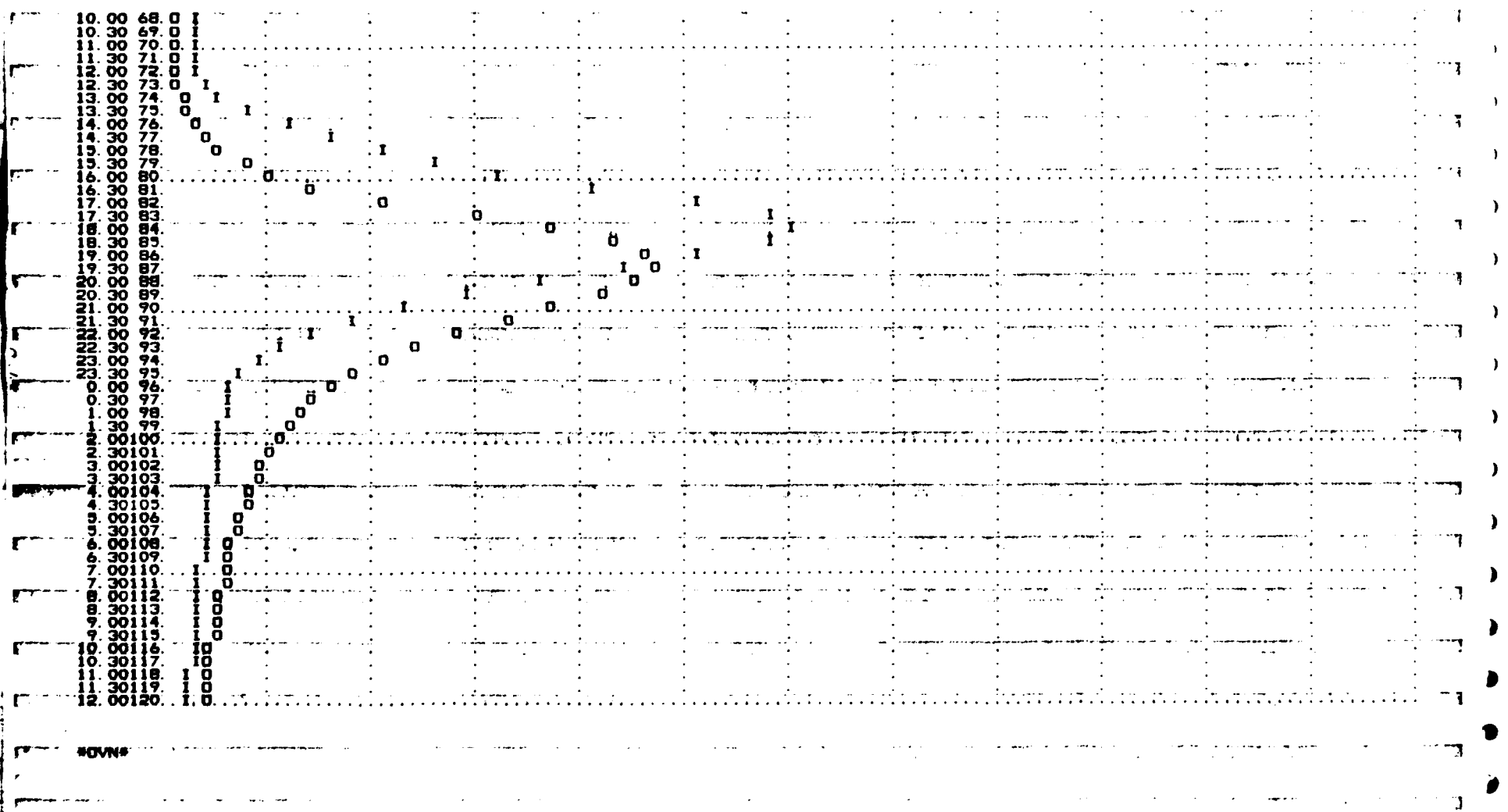
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1860.	1441.	587.	240.	28834.
CMS	53.	41.	17.	7.	816.
INCHES		6.01	9.80	10.02	10.02
MM		152.71	248.85	254.59	254.59
AC-FT		715.	1163.	1191.	1191.
THOUS CU M		882.	1437.	1470.	1470.

OVF STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

		0.	400.	800.	1200.	1600.	2000.	2400.	2800.	0.	0.	0.	0.	0.
0.	30	11												
1.	00	21												
1.	30	31												
2.	00	41												
2.	30	51												
3.	00	61												
3.	30	71												
4.	00	81												
4.	30	91												

5.00 101
5.30 111
6.00 121
6.30 131
7.00 141
7.30 151
8.00 161
8.30 171
9.00 181
9.30 191
10.00 201
10.30 211
11.00 221
11.30 231
12.00 241
12.30 251
13.00 261
13.30 271
14.00 281
14.30 291
15.00 301
15.30 311
16.00 321
16.30 331
17.00 3401
17.30 3501
18.00 3601
18.30 3701
19.00 3801
19.30 3901
20.00 4001
20.30 4101
21.00 4201
21.30 431
22.00 441
22.30 451
23.00 461
23.30 471
0.00 481
0.30 491
1.00 301
1.30 511
2.00 521
2.30 531
3.00 541
3.30 551
4.00 561
4.30 571
5.00 581
5.30 591
6.00 601
6.30 611
7.00 6201
7.30 6301
8.00 6401
8.30 650 1
9.00 66.01
9.30 67.01


10. 00 68. 0 I
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16. 30 81. 0 I
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17. 30 83. 0 I
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19. 30 87. I 0
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20. 30 89. I 0
21. 00 90. I 0
21. 30 91. I 0
22. 00 92. I 0
22. 30 93. I 0
23. 00 94. I 0
23. 30 95. I 0
0. 00 96. I 0
0. 30 97. I 0
1. 00 98. I 0
1. 30 99. I 0
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4. 30105. I 0
5. 00106. I 0
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6. 00108. I 0
6. 30109. I 0
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7. 30111. I 0
8. 00112. I 0
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9. 30115. I 0
10. 00116. I 0
10. 30117. I 0
11. 00118. I 0
11. 30119. I 0
12. 00120. I 0

SOVNS

STATION 1, PLAN 1, RATIO 9

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	1.	1.	1.	1.	1.	1.	1.	1.
1.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	3.	5.	9.	14.	19.	23.	27.	30.
32.	33.	33.	33.	33.	32.	31.	30.	29.	28.
27.	27.	26.	25.	25.	25.	25.	25.	25.	25.
25.	26.	27.	30.	35.	41.	49.	63.	78.	92.
108.	120.	134.	158.	197.	263.	371.	534.	777.	1186.
1653.	2195.	2769.	3292.	3672.	3852.	3840.	3671.	3388.	3035.
2659.	2291.	1950.	1646.	1382.	1156.	976.	838.	734.	679.
631.	590.	553.	521.	493.	468.	445.	425.	407.	389.
373.	358.	343.	329.	317.	305.	293.	282.	271.	260.

STORAGE

0.	0.	0.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	2.	2.	4.	7.	11.	15.	18.	21.	23.
25.	26.	26.	26.	26.	25.	24.	24.	23.	22.
21.	21.	20.	20.	20.	19.	19.	19.	19.	19.
20.	20.	21.	24.	27.	32.	38.	44.	50.	57.
63.	69.	75.	84.	98.	120.	134.	197.	247.	303.
366.	439.	516.	586.	637.	661.	660.	637.	599.	551.
501.	451.	406.	365.	329.	299.	274.	256.	241.	229.
219.	209.	201.	194.	187.	180.	175.	169.	164.	159.
154.	150.	145.	141.	137.	134.	130.	126.	123.	120.

STAGE

1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0	1558.0
1558.0	1558.0	1558.0	1558.1	1558.1	1558.1	1558.2	1558.2	1558.3	1558.3
1558.3	1558.3	1558.4	1558.3	1558.3	1558.3	1558.3	1558.3	1558.3	1558.3
1558.3	1558.3	1558.3	1558.3	1558.3	1558.3	1558.3	1558.3	1558.3	1558.3
1558.3	1558.3	1558.3	1558.3	1558.4	1558.4	1558.5	1558.6	1558.7	1558.8
1558.8	1558.9	1559.0	1559.1	1559.3	1559.6	1560.0	1560.5	1561.1	1561.7
1562.4	1563.3	1564.1	1564.9	1565.4	1565.7	1565.7	1565.4	1565.0	1564.5
1563.9	1563.4	1562.9	1562.4	1562.0	1561.7	1561.4	1561.2	1561.0	1560.9
1560.7	1560.6	1560.5	1560.4	1560.4	1560.3	1560.2	1560.1	1560.1	1560.0
1560.0	1559.9	1559.9	1559.8	1559.8	1559.7	1559.7	1559.6	1559.6	1559.5

PEAK OUTFLOW IS 3852. AT TIME 43.00 HOURS

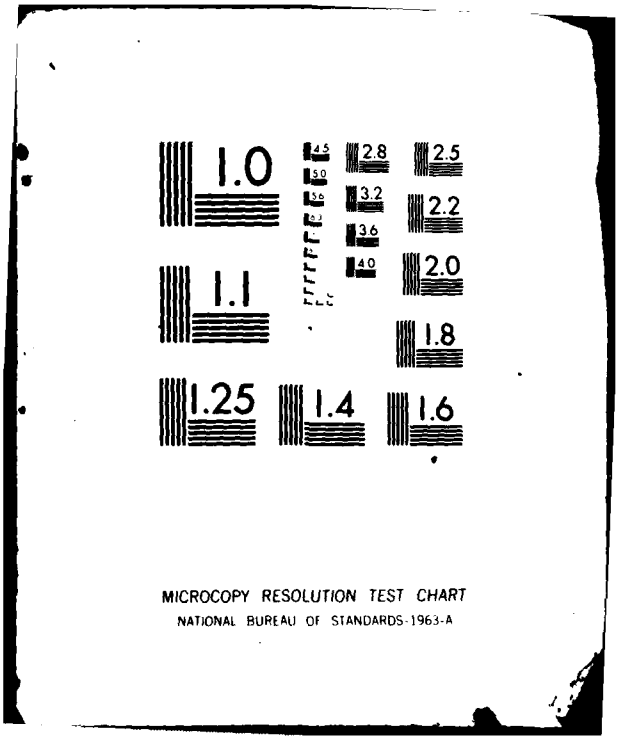
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3852.	3039.	1193.	489.	58662.
CMS	109.	86.	34.	14.	1661.
INCHES		12.68	19.91	20.39	20.39
MM		321.97	505.76	517.98	517.98
AC-FT		1507.	2367.	2424.	2424.
THOUS CU M		1859.	2920.	2990.	2990.

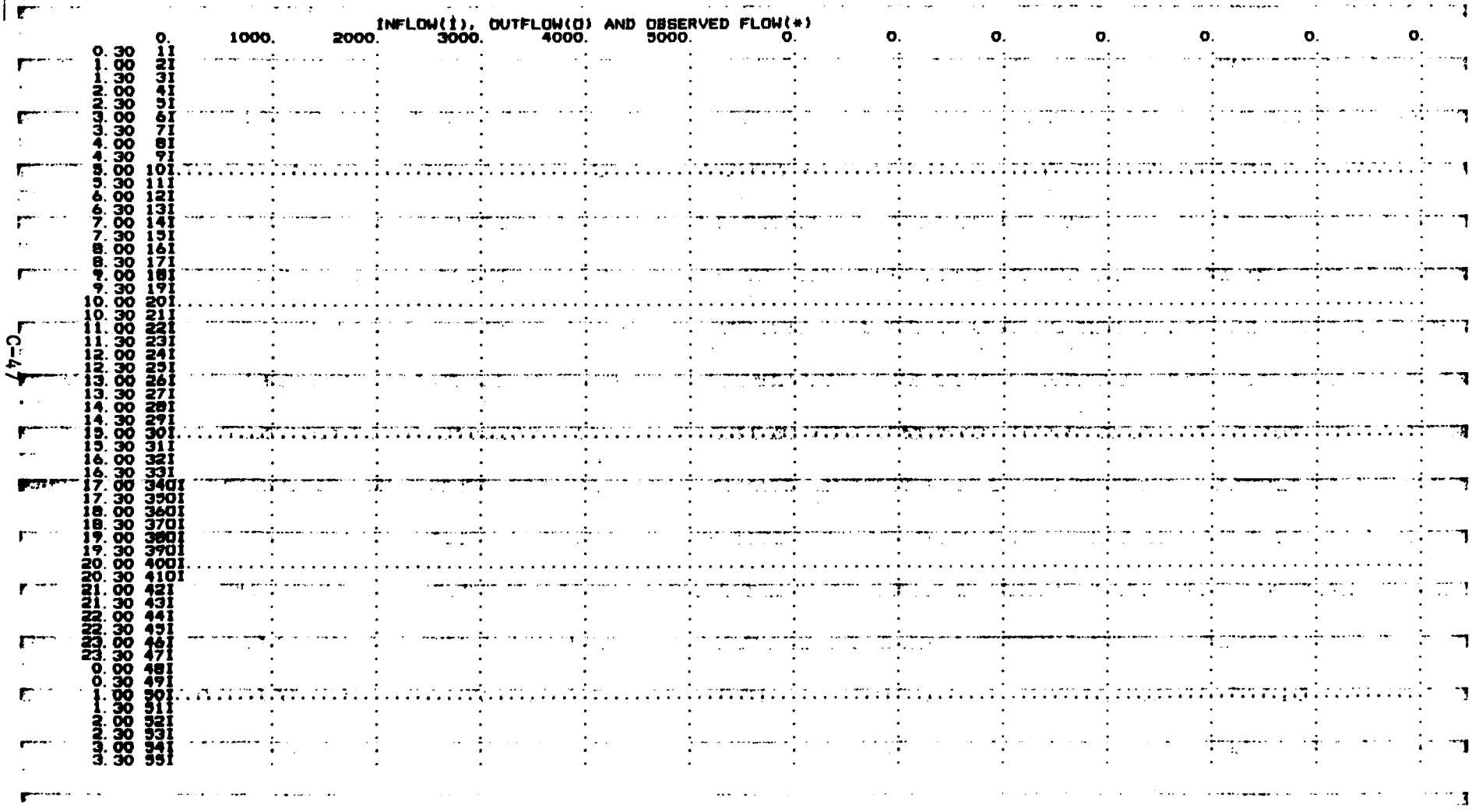
•OVF•

STATION 1

AD-A109 974 FLAHERTY-GIAVARA ASSOCIATES NEW HAVEN CT F/G 13/13
NATIONAL DAM SAFETY PROGRAM. GUILFORD LAKE DAM (INVENTORY NUMBE--ETC(U)
SEP 81 H C FLAHERTY DACW51-81-C-0006
UNCLASSIFIED NL

END
DATE FILMED
3-82
DTIC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A


INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)
0. 1000. 2000. 3000. 4000. 5000.
0. 0. 0. 0. 0. 0.
0.30 11
1.00 21
1.30 31
2.00 41
2.30 51
3.00 61
3.30 71
4.00 81
4.30 91
5.00 101
5.30 111
6.00 121
6.30 131
7.00 141
7.30 151
8.00 161
8.30 171
9.00 181
9.30 191
10.00 201
10.30 211
11.00 221
11.30 231
12.00 241
12.30 251
13.00 261
13.30 271
14.00 281
14.30 291
15.00 301
15.30 311
16.00 321
16.30 331
17.00 3401
17.30 3501
18.00 3601
18.30 3701
19.00 3801
19.30 3901
20.00 4001
20.30 4101
21.00 421
21.30 431
22.00 441
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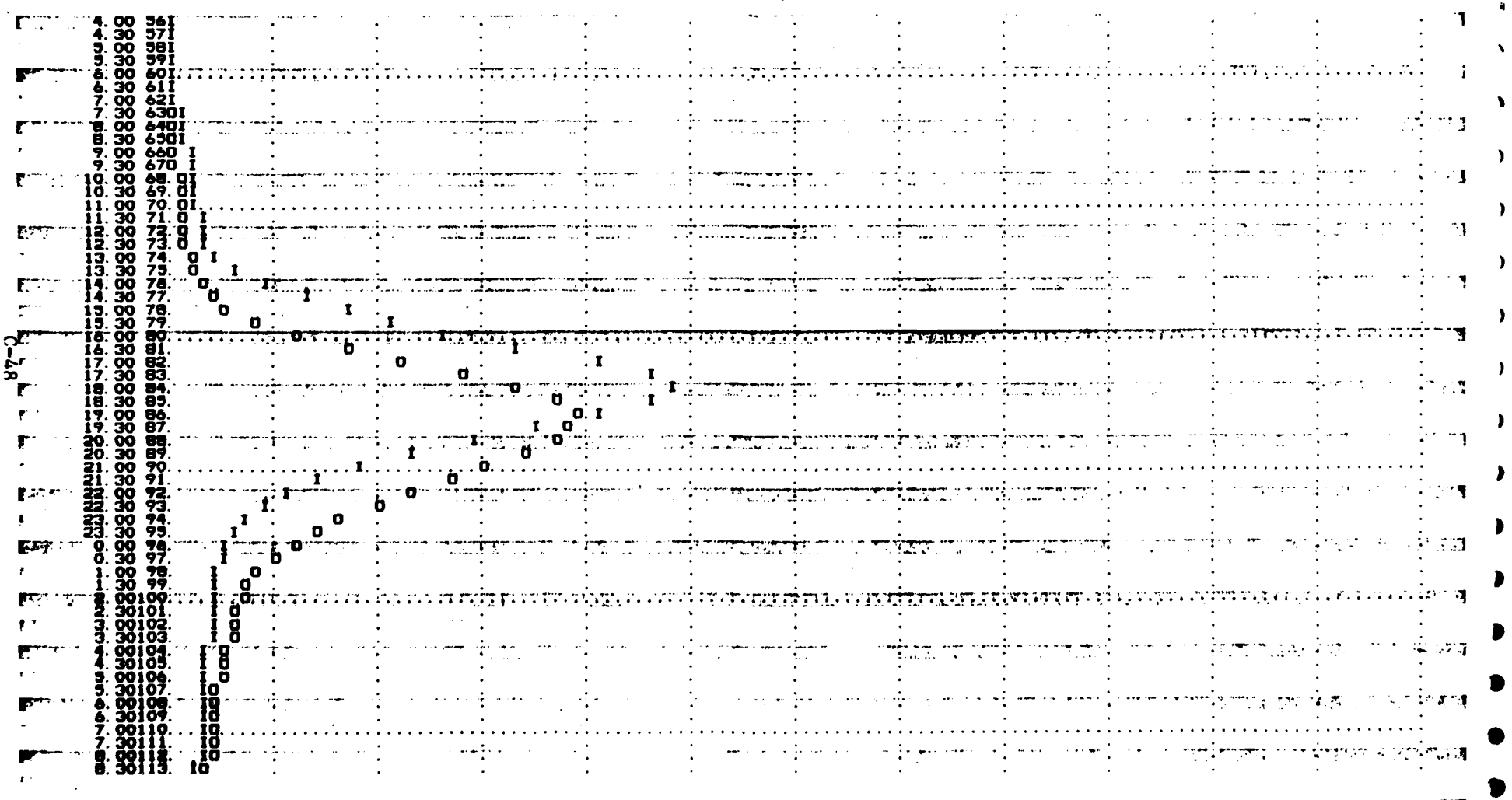
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10.30117. IO
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12.00120. IO
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OVN

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9
				0.10	0.15	0.16	0.17	0.18	0.19	0.20	0.50	1.00
HYDROGRAPH AT	1	2.23	1	483.	725.	773.	822.	870.	918.	967.	2416.	4833.
		(5.78)		(13.69)(	20.53)(	21.90)(	23.28)(	24.63)(	26.00)(	27.37)(	68.43)(	136.89)
ROUTED TO	1	2.23	1	249.	407.	440.	473.	510.	545.	583.	1860.	3852.
		(5.78)		(7.06)(	11.52)(	12.45)(	13.45)(	14.44)(	15.45)(	16.50)(	52.68)(	109.08)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
	ELEVATION	1558.00	1558.00	1560.20
	STORAGE	0.	0.	174.
	OUTFLOW	0.	0.	442.

RATIO OF PMF	MAXIMUM RESERVOIR W.S. ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.10	1559.51	0.00	116.	249.	0.00	44.50	0.00
0.15	1560.08	0.00	164.	407.	0.00	44.00	0.00
0.16	1560.19	0.00	173.	440.	0.00	44.00	0.00
0.17	1560.30	0.10	182.	473.	2.00	44.00	0.00
0.18	1560.40	0.20	191.	510.	3.00	44.00	0.00
0.19	1560.51	0.31	199.	545.	3.50	44.00	0.00
0.20	1560.60	0.40	208.	583.	4.00	44.00	0.00
0.50	1562.75	2.55	374.	1860.	7.50	43.50	0.00
1.00	1565.67	5.47	661.	3852.	15.00	43.00	0.00

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FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION  JULY 1978
  LAST MODIFICATION  26 FEB 79
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APPENDIX D

PREVIOUS INSPECTION REPORTS/AVAILABLE DOCUMENTS

PREVIOUS REPORTS

GUILFORD WATER SYSTEM
ENGINEERING REPORT

GENERAL AND HISTORICAL

Available history relative to the age of the Guilford Water System and past performance is incomplete due to an abecence of records kept under private ownership.

The system presently servicing the Hamlet of Guilford was purchased in 1961 by the Emerson's Water Works Company, Inc. from the Guilford Water Works Company, Inc. A search of the deeds indicates the system to be existant in 1890 and for an indeterminate period prior to that date.

Water is presently furnished to two churches, one post office, one firehouse, one school garage, two stores, one restaurant, two farms, and 83 residential consumers. An additional annual charge is levied against the Guilford Fire District.

SOURCE OF SUPPLY

The Emerson's Water Works Company owns the right to flood lands now under Guilford Lake to a depth of 15 feet from the bed rock bottom. A stone dam with a 6-inch concrete cap now exists at the southerly end of Guilford Lake presumably at the location described in the original deeds, some of which date to 1827. An earth fill extending for a considerable distance behind (on the lake side) of the dam could possibly be the result of a century of natural sedimentation as the entire concrete cap of the dam also serves as the spillway. This earth fill strengthens the dam and increases resistance to water penetration. Inspections indicate the structure to be relatively watertight, to require moderate repairs to the stonework, and to require a complete replacement of the concrete cap for one half of its length across the dam. An application to the Corps of Engineers for a more complete examination of the structure is recommended. This report includes a cursory examination of the condition of the dam as can be determined by visual observations under the condition of water flowing over the top of the dam. A detailed survey and report should be made in the immediate future to ensure the structural stability and safety of the dam.

Guilford Lake is located approximately 0.4 miles from the Hamlet of Guilford, has a surface area of approximately 66 acres and a drainage area of approximately 2.2 square miles. The depth of the lake varies from five feet along the general shore line to 65 feet in the center; the relatively deep center resulting from flooding the portion of the lake existing prior to the construction of the dam with an additional 15 feet of water. A total dependable yield of 1.61 MGD

has been established in the Chenango County Comprehensive Water Report prepared in 1968 by the Engineering Firm of Metcalf and Eddy and approved by the State of New York. A copy of Fig. 12 titled Guilford Population Center Water Supply Requirements, included in this report, indicates a potential average daily demand of 60,000 gallons per day and a potential maximum daily demand of 130,000 gpd in the year 2020 for the Hamlet of Guilford, both of which are considerably less than the total dependable yield. The comprehensive report recommends continuing the utilization of Guilford Lake as the source of water supply.

OTHER PROPERTIES

Lands owned by the water company include a portion of lands under the surface of Guilford Lake extending from the dam site northerly to the surface of the original lake prior to construction of the dam. Other lands include the stream bed and the major portion of the banks southerly to properties of James Brown.

The rights titles, and interest in and to the water pipes within the existing system; the rights, title, and interest in and to all contracts for supplying and conveying water within the Town of Guilford; and the rights to lay, repair, and continue the water system are also owned by the present water company.

QUALITY OF WATER

Raw water from Guilford Lake is presently used by the consumers with no pre-treatment other than chlorination. Previous tests on raw water samples have been recorded as follows:

Iron	0.38	(relatively high)
Manganese	0.38	(relatively high)
Color	22	Turbidity 3 ppm, Odor--Earthy
Hardness	35	ppm (good)
P. H.	7.1	Silica 3.0 ppm

Bacteriological examinations indicate a moderate count in the raw water supplies during the early part of the year which gradually increases during the summer months to the point where the water is not acceptable for a community water supply.

Periodic samples taken within the distribution system after chlorination have been accepted as satisfactory for potable water.

The water supply is generally satisfactory for consumption if chlorinated. Consideration should be given to removals of iron and manganese and to improvement of turbidity and odor.

WATER MAINS AND SERVICES

The existing water distribution system includes 2880 feet of 6 inch cast iron pipe, 5068 feet of 4 inch cast iron pipe and 200 feet

Town of Guilford

R. D. 1 - Box 103
Guilford, N. Y. 13780

March 23, 1981

Dear Sir:

Re: your recent inspection of Guilford Lake Dam.

I have checked and found there were no blueprints on the recent refacing job done on the dam; not so unusual the way other practices have been carried out during the last 8 years in the Town.

I have found that 3/4 inch steel reinforcing rods were used in a horizontal and vertical pattern extending from bed rock to and including the top and for the wing walls.

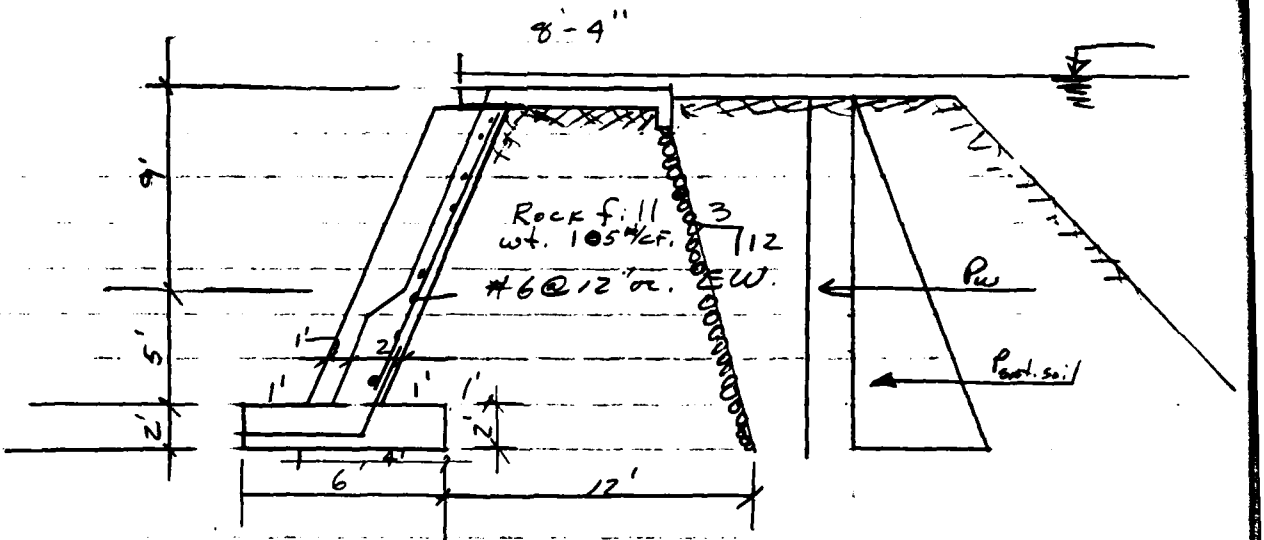
The face concrete was 8 to 10 inches wide and the top had 6 inches. Both wing walls are new. We feel with the gravel build up behind the dam and the very constant flow of water at all times this structure will be very sound for many years.

Sincerely Clifford E. Wade

Clifford E. Wade
Supervisor

APPENDIX E

STRUCTURAL STABILITY ANALYSIS



Composite action - Stone (water jet compacted) + Conc.

Section		Wt.
12'x16'x .1	=	19.2^K

Coef. of frict. = 1.0 $P_{H\,Resist.}$ = 19.2^K/Ft

$U = \frac{2}{3}(17') \times .0624 \times \frac{12'}{2} = 4.24^K$

$P_{H\,active}$:

(1) Ht. of water 1' above Spillway

(2) Ice at Top of Spillway

(3) .5 PMF Ht. of water at 4.8' above Spillway

Loading Case I:

$P_w = 1' \times .0624 = .0624^K/SF \times 16' = 1^K$ (1) @ 16/2 =

$P_{ss} = .055 \times \frac{16^2}{2} = 7.04^K$ @ 16/3

F.S.O.T.: Insufficient data

F.S.Sl.: $\frac{19.2 - 4.24}{8.04} = 1.86$ OK

Loc. of Res.: N/A

Loading Case: Normal + Ice

$P_w = 1^K/Ft$
$P_{ice} = 5^K/Ft$
$P_{s.s.} = 7.04^K Ft$

F.S.O.T. = N/A
Loc. of Res. = N/A

$F.S.\,sl. = \frac{19.2 - 4.24}{13.04} = 1.15$ Undesirable

Loading Case: .5 PMF

$P_w = 4.8 \times .0624 \times 16 = 4.79^K/Ft$
$P.s.s. = 7.04^K/Ft$
$U = 4.24^K$

F.S.O.T.: N/A Loc. of Res.: N/A

$F.S.\,sl. = \frac{19.2 - 4.24}{11.83} = 1.26$ Undesirable

MAX. Oper. Cond. Ht. of water level 2.2' above Spillway

$P_w = 2.2 \times .0624 \times 16 = 2.2^K$
$P_{SAT.} = 7.04^K$
$U = 4.24^K \uparrow$

F.S.O.T. = N/A Loc. of Res.: N/A
$F.S.\,sl. = \frac{19.2 - 4.24}{9.24} = 1.62$ OK

APPENDIX F

REFERENCES

REFERENCES

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2. Hydrologic Engineering Center, U.S. Army Corps of Engineers, HEC-1 Flood Hydrograph Package, Users Manual. Davis, California, January 1973.

3. Hydrologic Engineering Center, U.S. Army Corps of Engineers, Flood Hydrograph Package (HEC-1), Users Manual for Dam Safety Investigations, Davis, California, September 1978.

4. King, Horace and Brater, Ernest. Handbook of Hydraulics, 5th Edition. McGraw-Hill Book Company, New York, New York, 1963.

5. Riedel, J.T., Appleby, J.F. and Schloemer, R.W. Seasonal Variation of the Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1000 Square Miles and Durations of 6, 12, 24, and 48 Hours (Hydrometeorological Report No. 33) U.S. Department of Commerce - Weather Bureau and U.S. Department of the Army - Corps of Engineers, Washington, D.C., April 1956

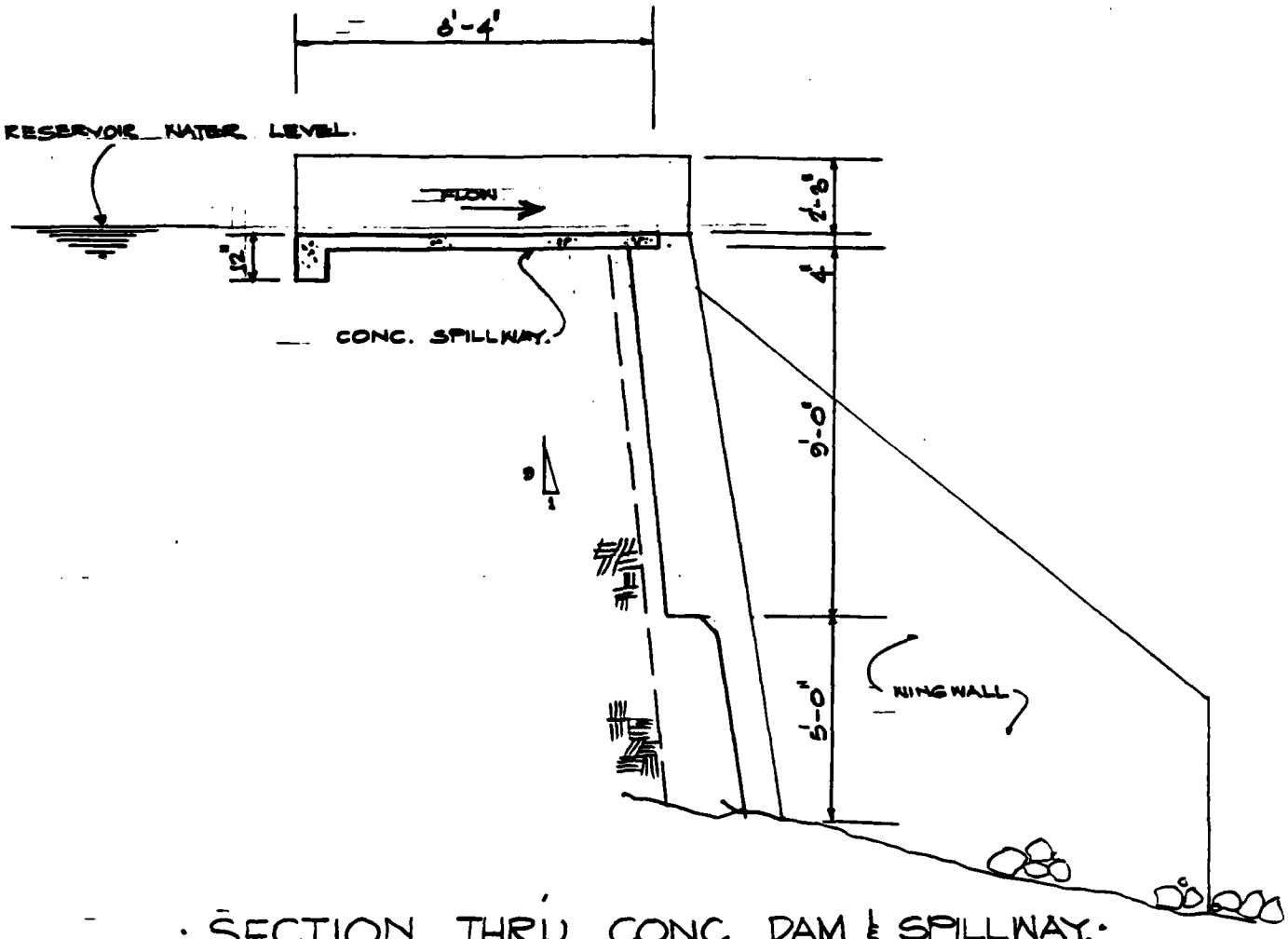
6. U.S. Department of the Interior, Bureau of Reclamation, Design of Small Dams, Second Edition, Washington, D.C., 1973.

APPENDIX G

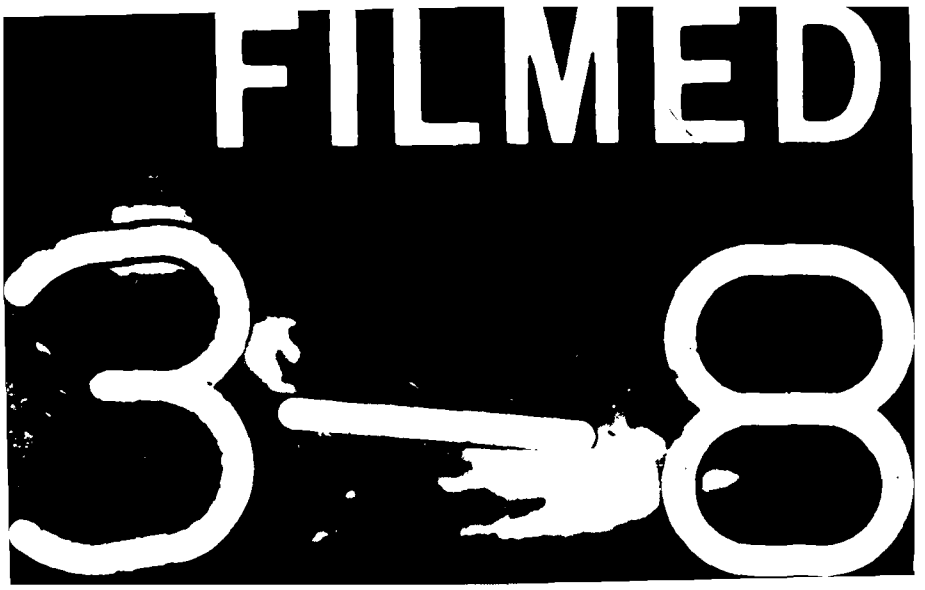
DRAWINGS

NAME OF DAM :

FED. ID NO. : 1483



· SECTION THRU CONC. DAM & SPILLWAY.·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